

目录

PRECAUTIONS	4
SAFETY GUIDE.....	5
OPERATOR	6
DECLARATION OF EXCEPTIONAL RESPONSIBILITY	6
1. NAME OF EACH COMPONENT & ITS FUNCTION	8
1.1 Name of Each Component.....	8
1.2 Operation Keys & Functions	10
1.3 Display.....	11
1.4 Symbols	12
2. PREPARATION FOR MEASUREMENT.....	13
2.1 Mounting the Instrument	13
2.2 Power On	15
2.3 Remaining Battery Display.....	15
2.4 Setting the record mode	16
2.5 SD Card	18
2.6 Menu.....	18
2.7 SET	19
2.8 Inputting Characters.....	19
2.9 Staff Collimation and Focus	21
2.10 Surveying Note	22
3. STANDARD MODE	23
3.1 Measure	23
3.2 S.O G.H(Stake out Ground Point).....	26
3.3 S.O H.D(Stake out Height Difference)	29
3.4 S.O Dist(Stake out Distance).....	31
4. LEVELING.....	34
4.1 Start Leveling.....	34
4.2 End the Leveling Measurement on the Transition Point.....	66

4.3 End the Leveling Measurement on the Bench Mark Point	68
4.4 Continue Leveling	70
5. OTHER FUNCTIONS.....	72
5.1 Manually Inputting Data Key—[MANU]	72
5.2 Display the Distance—[DIST].....	74
5.3 Inverse Staff Mode—[-].....	74
5.4 Record Data Search—[SRCH]	75
6 HORIZOTAL ANGLE MEASUREMENT	79
7. FORMAR FLASH OR SD CARD	81
8. DATA MANAGE.....	84
8.1 Create Group.....	86
8.2 Search Job	87
8.3 Copy Job	88
8.4 Delete Job	90
8.5 Check the Capacity of Flash or SD Crad	91
8.6 File Out.....	92
9. SET	94
9.1 Set Menu.....	94
9.2 Alter the Setting Mode.....	97
10. BATTERY AND CHARGER	99
10. ADJUSTMENT	100
10.1 Method A	100
10.2 Method B	104
11. TRANSPORTATION, STORING AND CLEANING.....	104
12. SPECIFICATION.....	106

FOREWORDS

Congratulations on your purchasing the Digital Level DL-201/2007. In order to operate this instrument correctly, please read this user manual carefully and keep it well so as to refer to it easily in the future. Before use, please check the standard features and make sure all the equipments and accessories are available.

In order to facilitate reading, some pictures are simplified.

PRECAUTIONS

Before using this instrument, please make sure that each function is running well.

- Avoid to make the surface of the digital staff as well as the joints between each section dirty or damaged, otherwise it will influence on the accuracy of reading and measurement. This is because the instrument needs to transfer the black & white bar code to electric signal. That's why in case the digital staff is dirty, the accuracy would be descended, or even the instrument is not able to measure.

- Tripod

The digital level should be mounted on wooden tripod. Metal tripod is lighter and shack easily, which will affect the accuracy. Each leg of the tripod should be fixed well by screws.

- Tribrach

Please check the adjusting screw on the tribrach frequently, do make sure the central fixing screw is tightened.

- Packing well to avoid the instrument shaken

The digital level should be handled carefully to avoid shaking and crashing during transportation. Severe shaking would damage the measurement functions. When packing the instrument in the case, make sure the instrument is power off and take off the battery too.

- Carry the instrument carefully

When you need to move the instrument, you must grasp the lifting handle and take it off from the tripod.

- Avoid to expose the instrument in sun, rain or humid condition

Leaving the instrument in place of high temperature (+50°C) would damage the instrument. Do not shoot the sun with the objective len; otherwise the spare parts inside the instrument may be damaged.

- Avoid the great change of temperature

A great change on instrument temperature would descend the measuring range. For example, when the instrument is moved out from a hot car, please leave the instrument to adapt to the surrounding temperature before use.

- Battery Inspection

Check the remaining battery before use.

- Digital Staff

Wear a glove when using a digital staff.

SAFETY GUIDE

Serious injury or even death may occur if the following cautions are ignored.

- In case of explosion, do not place the instrument close to inflammable gas, liquid, or solid. Do not operate it in coal mine or dusty place.
- Do not disassemble or repair the instrument without authorization in case of dangers like fire, electric shock or damage to the instrument. Disassembling and maintenance are only implemented by RUIDE and its authorized service providers.
- Do not use the telescope to sight at the sun or sunlight that are refracted by reflectors like prisms in case of any hurt to the eyes.
- Do not operate the instrument with the digital staff near high voltage cables or transformers, in case of electric shock accident.
- Do not use the digital staff when under bad weather (thunder) in case of electric shock.
- Do not use chargers and batteries produced by a third party in case of fire.
- Do not use a broken power supply, wires, sockets and plugs in case of fire or electric shock.
- Do not use humid batteries or chargers in case of fire or electric shock.
- Do not place the batteries in fire or high-temperature environment in case of explosion or damage.
- Do not use the power supply mentioned in the manuals of non-manufacturers in case of fire or electric shock.
- Do not circuit the batteries in case of fire.
- Do not disassemble or assemble the instrument or operate the plug with wet hands in case of electric shock.
- Do not cover the charger when it is charging in case of fire.
- Do not touch the liquid leaked from the battery in case of hurt by the harmful chemicals. And please change the battery.
- Injury to persons or damage to goods may occur if the following cautions are not

followed by operators.

- Harm: means hurt, burn, electric shock, etc.
- Damage: means serious damage caused to building, instrument or furniture.
- Overturning the instrument case may damage the instrument.
- Do not stand or sit on the case.
- Do not use the instrument case with broken belt, buckle, hinge, or lifting handle, in case that the instrument is damaged or it hurts the legs if the case falls.
- When mounting or delivering the instrument please be careful with the leg tips of the tripod.
- When mounting the instrument on the tripod, make sure the central fixing screw is tightened well to prevent the instrument from falling down.
- When mounting the instrument, make sure the screws of the tripod are tightened well.
- When moving the tripod, make sure the screws of the tripod are tightened well.

OPERATOR

- This instrument is only operated by technician.

It is required that the operator should be a qualified surveyor. Before operation, inspection and calibration, operators should be acknowledged the safety guidance.

- Please wear necessary suits for protection (e.g. safety shoes, safety helmet).
- Do not place the instrument directly on the ground. If the operator has to leave the instrument alone, please cover the instrument with a nylon cover (if available).

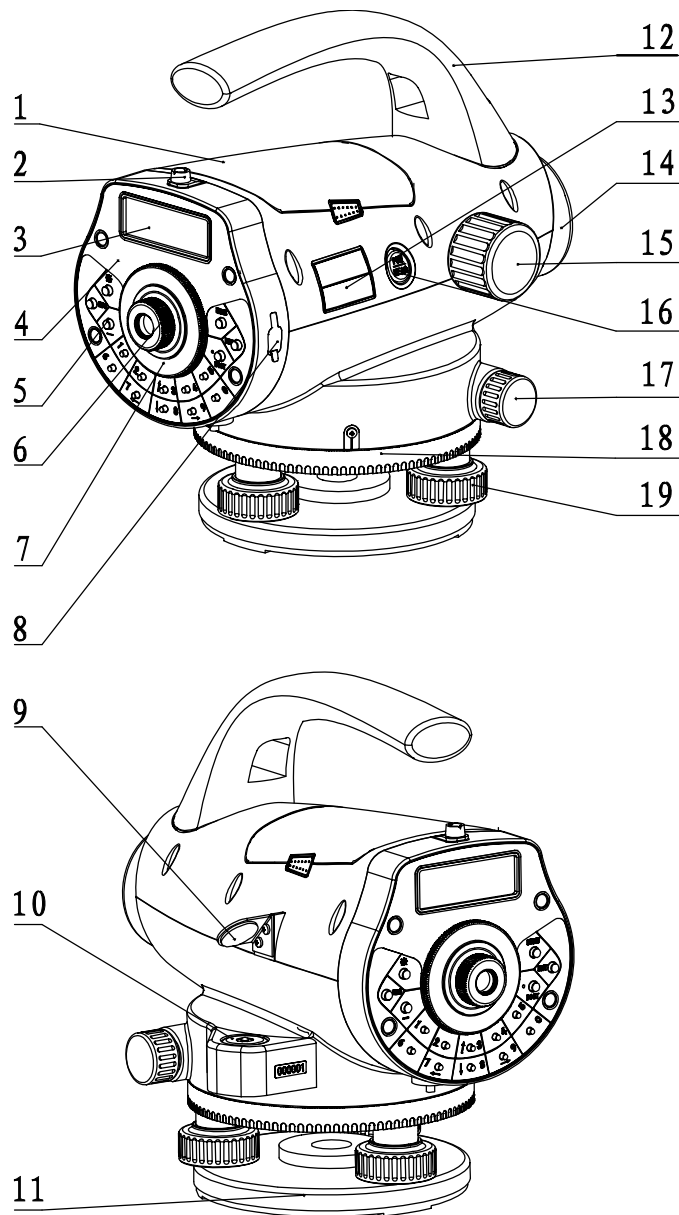
DECLARATION OF EXCEPTIONAL RESPONSIBILITY

- Users of this product should read the user manual thoroughly and implement periodical inspection to the performance of the instrument.
- Manufacturer and its dealers shall not be responsible for any direct or indirect consequences and profit loss resulted from destructive or intentional improper use.
- Manufacturer and its dealers shall not be responsible for any direct or indirect consequences and profit loss resulted from natural calamities (e.g. earthquake, hurricane, flood, etc.), fire, accidents, or fault of a third party.

- Manufacturer and its dealers shall not be responsible for failure to operate resulted from the fact that the data is changed or lost, or that operation is interfered.
- Manufacturer and its dealers shall not be responsible for any consequences and profit loss resulted from extra use without following the user manual.
- Manufacturer and its dealers shall not be responsible for any consequences and profit loss resulted from improper transportation or connecting with other products.


1. NAME OF EACH COMPONENT & ITS FUNCTION

1.1 Name of Each Component



- 1 battery
- 2 rough collimator
- 3 LCD display
- 4 keyboard panel
- 5 keys
- 6 eyepieces: use for adjusting the definition of the crosshair.
- 7 protecting cover of eyepieces: by releasing this cover, you can implement the mechanical adjustment of the reticle in order to correct the optical collimation line error.
- 8 data transfer port: connecting with PDA or computer.
- 9 reflector of circular vial
- 10 circular vial
- 11 tribrach
- 12 lifting handle
- 13 model label
- 14 objective lens
- 15 focusing hand wheel: use for focusing of digital staff.
- 16 power/measure key: use for instrument power ON/OFF, and measure.
- 17 horizontal tangent hand wheel
- 18 horizontal dial: use for setting the horizontal direction value of the collimating direction to 0 or other required values.
- 19 leveling screws of the tribrach

1.2 Operation Keys & Functions


key	name	function
POW/MEAS	Power ON/OFF Measure	Power ON/OFF, and start to measure. Power ON: press once; Power OFF: hold on for 2 seconds.
MENU	menu	Return to the menu list.
DIST	distance measure	In measurement status, press it to start measure the distance and display the distance.
↑↓	select	Turn the page of menu list or data list.
→ ←	Number moving	Turn the left or right page when viewing the data, or move left or right in inputting status.
ENT	enter	To confirm the parameters or inputting data.
ESC	ESC	To escape from menu or any setting mode. Also to go backspace to delete a character in inputting mode.
0~9	number keys	Inputting numbers.
—	Mode of setting inverse staff	Use for inputting inverse staff. Set the inverse staff. You should activate this function in parameter setting first.
	illumination	Turn ON/OFF the illumination
.	decimal point	Input a decimal point; while inputting symbols or characters use this key to switch between alphabets and numerals.
REC	Record key	To record the measured data
SET	Set key	Enter the setting mode to set the measurement parameter, condition parameter and instrument parameter.
SRCH	Search key	Use for searching and displaying the record data.
IN / SO	Intermediate point/Stake out key	To measure the intermediate point or to stake out while carrying out the Leveling measurement.
MANU	Manually	To input the data manually when the [MEAS] key

	input key	cannot be used to take measurement.
REP	Repeat measuring key	To repeat measuring the measured backsight or foresight point in the leveling measurement

1.3 Display

The display adopts dot matrix LCD, displaying 4 lines, with 20 characters in each.

LCD illumination: ON/OFF.

Press  to turn ON or OFF the illumination. It can be set in instrument parameters too.

Setting Contrast

There're 9 degrees for the contrast. Please refer to parameter setting to know how to set the contrast.

Example:

Menu 1/2 ► Standard Mode Leveling Adjust

Standard Mode


Menu 1/2 Standard Mode ► Leveling Adjust

Leveling Mode

Measure Rod: Dist: N:3 >>>>>>>

Measuring

1.4 Symbols

key	function	key	function
p	The current data has been saved.	a/b	Several pages or menus are available which can be selected by [▲] [▼], b: total pages, a: current page
	Battery level	Inst Ht	Instrument height
BM#	Bench Mark	CP#	Changeover Point
I	Staff Inversion		

2. PREPARATION FOR MEASUREMENT

2.1 Mounting the Instrument

Placing the Tripod.

Type E aluminum tripod with flat or dome head tripod is required.

- (1) Adjust the three legs of the tripod to a proper length and tighten the fixing screws at the middle of the leg.
- (2) Tighten the hexagonal nut on the head of the tripod in order to make the tripod legs not too loosen. Place the tripod on a certain point, expand the legs until the distance between each leg is about 1m. First, fix a leg, and move the other 2 legs to make the head of the tripod approximately leveled. If necessary, adjust the length of the tripod legs.
- (3) Trample the legs into the earth or fix it well on the ground.

Mount the Instrument on the Head of the Tripod.

Take out the instrument carefully and place it on the head of the tripod.

- (1) Aim the tripod central screw to the center of the tribrach and tighten the screw until it is fixed at the head of the tripod.
- (2) If you need to define an angle or a line through the horizontal dial, you should center the instrument precisely with a plummet.
- (3) Center the circular bubble by adjusting the three leveling screws of the tribrach. If you are using a dome headed tripod, you should slightly loosen the tripod central screw and rotate the instrument round the head of the tripod until the circular bubble is centered, then tighten the screw.

Mounting the Instrument on a Certain Point (centering)

If you need to measure an angle or alignment, please precisely center the instrument at a certain point with the plummet.

- (1) Hang the plummet at the plummet hook of the central screw of the tripod.
- (2) Adjust the plummet line to a proper height.
- (3) In case the instrument is not centered at the known point, you can move the instrument to that point without changing the position relationship between the tripod leg and its head. First, put the tripod on the known point approximately until

the plummet is about 1cm away from the point. Second, grasp two legs of the tripod and adjust the tripod by the third leg until the head of tripod is leveled approximately with a proper height. Expand the legs of the tripod and fix it on the ground.

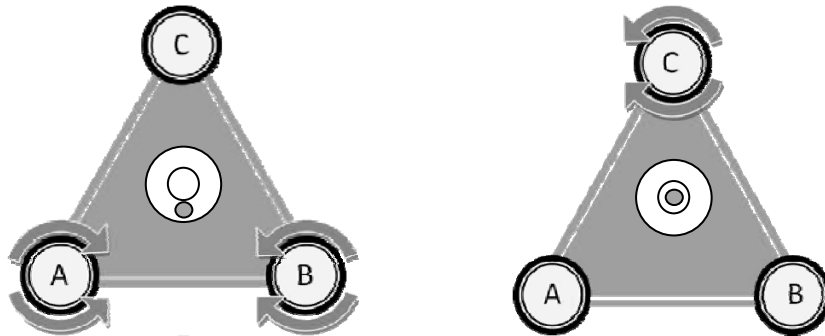
(4) Finally, observe the plummet and the hook and trample the legs into the ground.

(5) Slightly loosen the central screw of the tripod and move the instrument on the head until the plummet is centered at the known point. Tighten the tripod central screw.

Leveling the Instrument

Center the circular bubble by adjusting the tribrach screw.

First, put the tribrach as the below picture shown. Rotate 2 screws at the same time in opposite direction until the bubble moves to a position where the line between the bubble and screw C is perpendicular to the line between screw A and B (refer to Picture A). Then rotate the screw C to move the bubble to the center of the central circle. This procedure should be repeated for times until the bubble is centered on any directions. While leveling, remember the “Left Thumb Principle” which means that the moving direction of the bubble is the same as that of the left thumb. Do not rotate the leveling screw without thinking.



Notice: Do not touch the telescope during leveling.

Collimating and Focusing

(1) Sight at the digital staff with the rough collimator.

(2) Rotate the eyepiece slowly until the image of the crosshair becomes clear.

(3) Rotate the focusing hand wheel until the image of digital staff becomes clear.

Rotate the horizontal tangent to move the image of the staff to the center of the

vertical hair of the crosshair.

(4) Observe through the eyepiece. Move your eye slightly up, down, left and right to check whether the relative position between the crosshair and the image of the staff is not changed. If not, please return to step 1.

Notice: Measurement accuracy may be influenced if the crosshair and focusing is not clear.

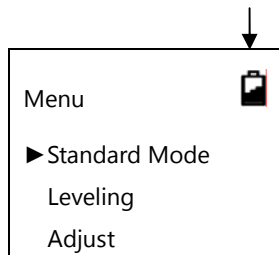
2.2 Power On

Press the power key (POW/MEAS).

2.3 Remaining Battery Display

The battery symbol indicates the remaining battery.

battery symbol



Full



Sufficient



Half



Battery low. Please change the battery.



The power will be cut off soon. You need to change the battery.

2.4 Setting the record mode

In order to save the measurement data in the internal memory of the instrument, the data saving mode should be set as auto save before leveling measurement. The default setting is "OFF".

Flash:

Save the measured data (jobs) into the internal memory

- User can choose "Flash" in "Out Module" of "Condition" Setting if the data needs to be saved in the flash.
- The maximum storage of memory is about 20,000.
- The maximum number of jobs is 500.
- Folder can not be created in the memory.

SD Card:

The measured data can be saved directly into the SD card.

- User can choose "SD" in "Out Module" of "Condition" Setting if the data needs to be saved in the SD card.

Communication Port:

Connect DL-201 with external device by cable to receive the real-time measuring data. User can only use Standard Measurement mode in this condition.

Off:

The measuring data will be displayed without storing and outputting, user can not use Leveling Measurement mode in this condition.

See next page for the example.

Operating Procedures	Operation	Display
1. Press [Set] key to enter the setting mode on Menu screen, see detail in Chapter 9 "Set".	[SET]	<div>Menu 1/2</div> <div>► Standard Mode</div> <div>Leveling</div> <div>Adjust</div>
2. Press [▲] or [▼] key to enter the "Out Module" in Condition setting.	[▲] or [▼]	<div>Setting</div> <div>Measurement</div> <div>► Condition</div> <div>Instrument</div>
3. Press [ENT] key;	[ENT]	<div>Condition 1/2</div> <div>Point No.</div> <div>Wait Time</div> <div>► Out Module</div>
4. Press [▲] or [▼] key to select.	[▲] or [▼]	<div>Out Module 1/2</div> <div>► OFF</div> <div>Flash</div> <div>SD</div>
5. Press [ENT] to confirm.	[ENT]	<div>Out Module 1/2</div> <div>OFF</div> <div>► Flash</div> <div>SD</div>

Note: When the output is in "Flash", the "F" mark will be displayed on the top right side of the screen; when the output is in SD card, the "S" mark will be displayed; when the output is by USB, the "U" mark will be displayed; when the output is off, no mark will be displayed.

2.5 SD Card

User can use SD card for data storage, data copy and data search.

SD card function only can be used while the "Out Module" is set as "SD"

To format the SD card please refer to the Chapter 7 "Format Flash or SD Card"

For SD card management, please refer to the Chapter 8 "Data Manage"

Note: When the system is loading data from the SD card, do not remove the battery and SD card, otherwise, the saved data will be damaged, even it will influence on the memory storage; the defective SD card may damage the memory storage.

2.6 Menu


The menu includes following programs, the functions located in different menus which can't be always optional at the same time. (You may change the mode for different functions)

For example, when the "Out Module" is "Communication port" or "OFF", the Leveling Mode and Adjust Mode can not be carried out. If user enters the Leveling mode, the "Start Leveling" and "Continue Leveling" can not be chosen at the same time.

	1 st Menu	2 nd Menu	3 rd Menu	4 th Menu
Menu	Standart Mode	Measure		
		S.O G.H		
		S.O H.D		
		S.O Dist		
	Leveling	Start Leveling	BFFB	
		Continue	BBFF	
		End Leveling	BF/BIF	
			Outward/Return	
	Adjust	Method A		
		Method B		
	Data manage	Make Group		
		Input Pt		
		Search	Flash / SD	Job / PN / BM#
		Copy Job	Flash / SD	
		Delete Job	Flash / SD	
		Check Capacity	Flash / SD	
		File Out	Flash / SD	
	Format		Flash / SD	

2.7 SET

"Set" key is used for setting the parameters. When carry out the precise measurement, it is recommended to use the continuous measuring mode which will help improve the accuracy by the average value; "Auto power off" is available, which means that the power will be cut off in 5 minutes without any operation; Data will be saved automatically in the Leveing mode while

power off; The backlight can be switched by using the  key.

SET	Measurement	Measure Mode	Single / N Times / Continuous
		Minimum Reading	Srandard 1mm / Precise 0.1mm
		Inverse Mode	Use / No Use
		Unit	m(meter) / ft(US.ft)
		Diff	B-F Dif/TolDil/StafDif
	Condition	Point No.	Increase / Descend
		Wait Time	1~9 Second
		Out Module	OFF/Flash/SD/Communication
		Communication	Standard / User
		Auto Off	5 min / Off
	Instrument	Contrast	1~9
		Backlight	On/Off
		Instrument Info	

2.8 Inputting Characters

When the "Out Module" is on, user can input the alphabets and numerals in the place that needs to be noted.

Lowercase letters and symbols are only available inputted into the Info, on other inputting status, only capital letter and number are available.

Program	Character	Maximum
Group (SD Card Only)	Only capital letter, number and "-" etc.	8 Characters
Job	Only capital letter number and "-" etc.	8 Characters
Info	Lowercase and capital letter, number and all symbols	16 Characters

For example: Input "Tp#7" in Info1

Operating Procedures	Operation	Display
1. Press [●] key to enter the capital letter inputting mode.	[●]	<div>Measure</div> <div>Info#1</div> <div>=></div>
2. Press [◀] or [▶] key until the cursor flashes in the letter "T".	[◀]or[▶]	<div>Measure</div> <div>Info#1 ?</div> <div>=></div> <div>QRSTUVWXYZA<u>B</u>CDEFGHIJ</div>
3. Press [ENT] key to enter "T" which will be displayed at the bottom of the line.	[ENT]	<div>Measure</div> <div>Info#1 ?</div> <div>=></div> <div>JKLMNOPQRS<u>I</u>UVWXYZABC</div>
4. Press [●] to input the lowercase letter.	[●]	<div>Measure</div> <div>Info#1 ?</div> <div>=> T</div> <div>qrstuvwxyz<u>a</u>bcdefghij</div>
5. Press [◀] or [▶] key until the cursor flashes in the letter "p" and press[ENT].	[◀]or[▶] [ENT]	<div>Measure</div> <div>Info#1 ?</div> <div>=> T</div> <div>ghijklmnop<u>p</u>qrstuvwxyz</div>
		<div>Measure</div> <div>Info#1 ?</div> <div>=> Tp</div> <div>fghijklmnop<u>p</u>qrstuvwxyz</div>

6. Press [●] to enter the symbol inputting mode.	[●]	Measure Info#1? => Tp ?@[_]^{}!'"#%&'()*
7. Press [◀] or [▶] key until the cursor flashes in the letter "#", then press [ENT].	[◀] or [▶] [ENT]	Measure Info#1? => Tp [_]^{}!'"#%&'()*+ -
8. Press [ESC] key to enter numeral inputting mode.	[ESC]	Measure Info#1? => Tp# [_]^{}!'"#%&'()*+ -
9. Press numeric key [7], after confirming the inputted content, press [ENT] key.	[7] [ENT]	Measure Info#1? => Tp#7

- Use [●] key to switch the input mode.

Capital letter Lowercase letter Symbol
 ABCD ↔ abcd ↔ !'"#\$

- Available symbols to input are as follow:

! " # \$ % & () * + - . / : ; < = > ? @ [_] ^ \ { | }

2.9 Staff Collimation and Focus

(1) Focusing

Adjust the eyepiece focusing screw until the crosshair can be seen clearly. Then adjust the focusing screw until you can see the staff clearly through the objective lens.

A precise focusing can shorten the measuring time and improve the accuracy.

Measurement of high accuracy requests precise focusing as well as continuous measures.

(2) Obstacles

Measurement can be implemented if the staff is blocked less than 30%. Even if the crosshair center is blocked, as long as the field of view is blocked less than 30%, measurement still can be implemented. However, in this case, the accuracy might be affected.

(3) Shadow

The surveying accuracy may be influenced if the staff is covered by shadow. In some cases, it is not possible to measure.

(4) Backlight

If the background of the staff is very bright, it will affect the contrast of the staff, the digital level might not be able to measure. You can cover something ahead of the objective lens in order to reduce the background light invading to the lens. When a strong light comes into the eyepiece, it might not be able to measure either. You can also cover the eyepiece in order to block the strong light from coming into the eyepiece.

When the sun is in a low position (for example, in the morning or at night fall), or if the sun light comes into the objective lens directly, it is suggested to block the sunlight with hands.

2.10 Surveying Note

In order to make full use of the functions of instrument, please pay attention to the following:

(1) Set up the staff in bright place. If possible, prolong the staff completely. If illumination is employed, it is suggested to illuminate the whole staff, otherwise the accuracy might be affected.

(2) The shortest distance between instrument and staff is 1.5m.

(3) It will affect the accuracy when staff blocked. If the bar code on the staff is

blocked by tree branches or leaves, the digital level might display error, or the accuracy decreased.

(4) If the place where the staff located darker than that of the eyepiece, an error might occur; you can block the light for the eyepiece with something proper.

(5) Deflection and pitching of the staff may affect the accuracy. During the measurement, make sure the staff is paralleled to the vertical hair of the reticle. The staff should be unfolded completely and fixed well. Make sure the joints of the staff are well and precise. Avoid to measure through the glass window.

(6) After a long storage or transportation, check and calibrate the digital and optical sight errors. Then adjust the circular vial and keep the optical parts clean.

3. STANDARD MODE

Standard Mode includes Measure, S.O G.H, S.O H.D and S.O Dist.

3.1 Measure

In Measure function, user can measuring the staff reading and distance without calculating the ground height. When the "Out Module" in "Condition Setting" is set as "Flash" or "SD", user needs to input job name and information. All Data will be saved in the flash or SD card.

For the measuring time, please refer to the "Measure Mode" of "Measurement Set"

[Example]: "Out Module" is "Flash", "Measure Mode" is 3 times

Operating Procedures	Operation	Display
1. Press [ENT] key.	[ENT]	<div>Menu 1/2</div> <div>► Standard Mode</div> <div>Leveling</div> <div>Adjust</div>
2. Press [ENT] key.	[ENT]	<div>Standard Mode 1/2</div> <div>► Measure</div> <div>S.O G.H</div> <div>S.O H.D</div>
3. Input the job name and press [ENT]. ※1), 3)	Input job name [ENT]	<div>Measure</div> <div>Job Name?</div> <div>=>J01</div>
4. Input measuring point name 12 and press [ENT]. ※1), 3)	Input measuring point [ENT]	<div>Measure</div> <div>Meas#</div> <div>=>12</div>
5. Input the note1-3 and press [ENT]. ※1) ※3)	Input Info 1 [ENT]	<div>Measure</div> <div>Info#1?</div> <div>=>1</div>
● If user want to skip the note 2 and enter to step 6, it just needs to press [ENT] key.	Input Info 2 [ENT]	<div>Measure</div> <div>Info#2?</div> <div>=>1</div>

6. Collimate at the staff.	Input Info 3 [ENT]	<div>Measure Info#3? =>1</div>
7. Press [MEAS] key. Measuring for 3 times and the result will be displayed for M seconds※4) ※5).	[MEAS] Continuous [ESC]	<div>Measure Press[MEAS] to meas Meas#:12</div>
● If the Measure Mode is Continuous, press [ESC], the last measuring result will be displayed for M seconds.		<div>Measure Rod: Dist: N:3 >>>>>></div>
8. Press [REC] key to save the result. ※6).	[REC]	<div>Measure 1/2 Rod Ave:0.8263m Dist Ave:18.818m N:3 δ:0.04mm</div>

※1) The maximum of job name is 8 characters of capital letter or number, and the maximum of note is 16 characters of lowercase and capital letter, number and symbols.

※2) The maximum of point name is 8 characters.

※3) When the "record mode" is off, the job name, point name and note can not be inputted.

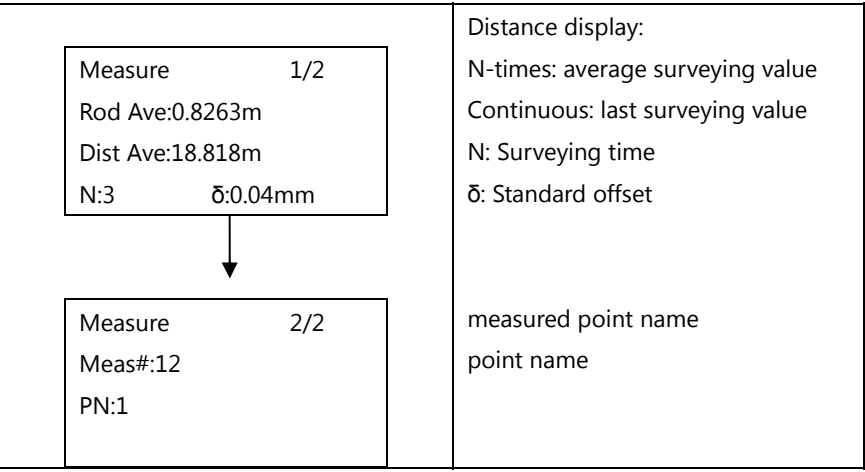
● Relationship between measuring number (Mn) and point name(Pn)is as follow:

Mn 11	Pn 1	Mn 12	Pn 1	Mn 13	Pn 1.....
	Pn 2		Pn 2		Pn 2
	Pn 3		Pn 3		Pn 3

.	.	.
.	.	.
.	.	.

- ※4) "Wait Time" can be set manually, please refer to "Set"
- ※5) After measuring, the result will be displayed. Press [▲] or [▼] to switch the page.
- ※6) After being saved, the point name will increase or descend automatically.

After measuring, press [▲] or [▼] key to switch the pages



3.2 S.O G.H (Stake out Ground Point)

System can measure the height of corresponding point B by the height value ($H_a + \Delta H$),

which is calculated by the height (H_a) of the known point A. The measurement result will not be saved.

Please see the example in the next page.

Operating Procedures	Operation	Display
1. Press [ENT] key.	[ENT]	<div>Menu 1/2</div> <div>► Standard Mode</div> <div>Leveling</div> <div>Adjust</div>
2. Press [ENT] key.	[ENT]	<div>Standard Mode 1/2</div> <div>Measure</div> <div>► S.O G.H</div> <div>S.O H.D</div>

<p>9. Press [▲] or [▼] key to switch to the page of sight distance and height of stakeout point, then press [ENT].</p> <p>10. Press [REP] to start a new stakeout job and start over backsight point surveying. Press [ENT] to continue stakeout measurement. Press [ESC] to exit.</p>	[ENT]	<div data-bbox="911 145 1190 268"> S Dist: 26.78m G.H: 22.90m </div> <div data-bbox="911 309 1190 481"> S.O G.H REP: New Meas ENT: Continue ESC: Exit </div>
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3.3 S.O H.D (Stake out Height Difference)

According to the inputted height difference ΔH which calculated from known point A

and point B, system can measure out the corresponding point B, the measurement result will not be saved.

Operating Procedures	Operation	Display
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1. Press [ENT] key.	[ENT]	<div>Menu 1/2</div> <div>► Standard Mode</div> <div>Leveling</div> <div>Adjust</div>
2. Press [ENT] key.	[ENT]	<div>Standard Mode 1/2</div> <div>Measure</div> <div>S.O G.H</div> <div>► S.O H.D</div>
3. Input height difference value and press [ENT].	Input H.D [ENT]	<div>S.O H.D</div> <div>Input SO H.D</div> <div>=-1.000 m</div>
4. Focus and sight at the backsight point, then press [MEAS].	[MEAS]	<div>S.O H.D</div> <div>Meas BS Pt</div> <div>Press[MEAS] to meas</div>
5. The measuring result of backsight point will be displayed, then press [ENT] key.	[ENT]	<div>S.O H.D F</div> <div>B Rod: 1.512m</div> <div>B Dist : 26.78m</div> <div>N:3 δ:0.4mm</div>
6. Focus and sight at the stakeout point, then press [MEAS].	[MEAS]	<div>S.O H.D</div> <div>Meas SO Pt</div> <div>Press[MEAS] to meas</div>
	[▲] or [▼]	<div>S.O H.D</div>

<p>7. The measuring value and stakeout value will be displayed. ↓ indicates that the staff is too high and it needs to be moved down.</p> <p>8. Press [▲] or [▼] key to switch to the page of S Dist (Sight Distance) and H.D (Height Difference) of stakeout point, then press [ENT].</p> <p>9. Press [REP] to start a new stakeout job and start over backsight point surveying. Press [ENT] to continue stakeout measurement. Press [ESC] to exit.</p>	[ENT]	<div data-bbox="909 145 1182 268"> S Rod: 1.612m H.D: ↓ 0.900m N:3 δ:0.4mm </div> <div data-bbox="909 311 1182 479"> S.O H.D S Dist: 26.78m H.D: -0.100m </div> <div data-bbox="909 519 1182 687"> S.O H.D REP: New Meas ENT: Continue ESC: Exit </div>
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3.4 S.O Dist(Stake out Distance)

According to the inputted distance Dab from known point A to point B, system can measure the corresponding point B. The measurement result will not be saved.

Operating Procedures	Operation	Display
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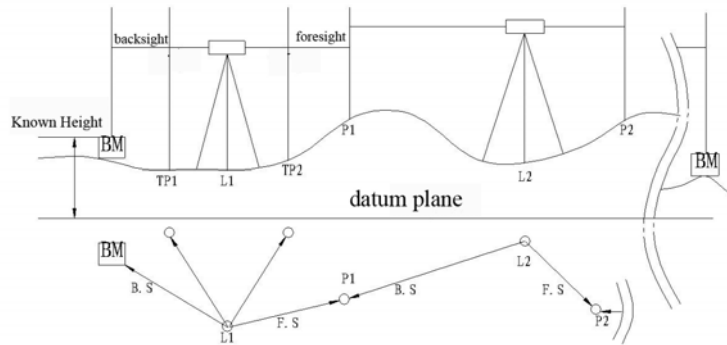
1. Press [ENT] key.	[ENT]	<div>Menu 1/2</div> <div>► Standard Mode</div> <div>Leveling</div> <div>Adjust</div>
2. Press [▼] key.	[▼]	<div>Standard Mode 1/2</div> <div>Measure</div> <div>S.O G.H</div> <div>► S.O H.D</div>
3. Press [ENT] key;	[ENT]	<div>Standard Mode 2/2</div> <div>► S.O Dist</div>
4. Input stakeout distance and press [ENT];	Input S.O Dist [ENT]	<div>S.O Dist</div> <div>Input SO Dist</div> <div>=15.000 m</div>
5. Focus and sight at the stakeout point, then press [MEAS].	[MEAS]	<div>S.O Dist</div> <div>Meas SO Pt</div> <div>Press[MEAS] to meas</div>
6. Press [▲] or [▼] to switch page and display the rod reading and input value, then press [ENT].	[▲] or [▼] [ENT]	<div>S.O Dist</div> <div>S Dist: 26.78m</div> <div>Dist: ←11.78m</div>
7. Press [ENT] to continue stakeout measurement. Press [ESC] to exit.	[ENT] or [ESC]	<div>S.O Dist</div> <div>S Rod: 1.005m</div>

		Input: 15.00m
		<div>S.O Dist</div> <div>ENT:Continue</div> <div>ESC:Exit</div>

4. LEVELING

In Leveling Mode, “Out Module” should be set as “Flash” or “SD”. In this section, we take “Flash” for example.

If user wants to save leveling measured data directly to SD card, the “Out Module” should be set as “SD”.



4.1 Start Leveling

In “Start Leveling” function, user should input job name, pointname and height of benchmark, and then start to do the measuring.

Leveling 1: B1→F1→F2→B2

Leveling 2: B1→B2→F1→F2

Leveling 3: B→F/ B→I→F

Leveling 4: Outward/Return: B1→F1→F2→B2/ F1→B1→B2→F2

After measuring a station, user can switch off the instrument to save power, the instrument will automatically continue the next station measurement after power on. If the measurement do not finish while power off, the point needs to be remeasured after switching on the instrument.

Operating Procedures	Operation	Display
1. Press [ENT] key.	[ENT]	<div>Menu 1/2</div> <div>Standard Mode</div> <div>► Leveling</div> <div>Adjust</div>
2. Press [ENT] key.	[ENT]	<div>Leveling</div> <div>► Start Leveling</div> <div>Continue Leveling</div> <div>End Leveling</div>
3. Input job name and press [ENT].	Input Job Name [ENT]	<div>Leveling</div> <div>Job Name?</div> <div>=>J01</div>
4. Press [▲] or [▼] to choose Leveling Measurement mode and press [ENT];	[ENT]	<div>Leveling</div> <div>► B1→F1→F2→B2</div> <div>B1→B2→F1→F2</div> <div>B→F/B→I→F</div>
5. Press [▲] or [▼] to choose from Input BS Pt or Transfer(call up an existed basepoint height). ※1) Then press Enter.	[▲] or [▼] [ENT]	<div>Leveling 1/2 F</div> <div>Input BS Pt</div> <div>Transfer</div>
6. Input the point name of benchmark and press [Ent]	Input BM# [ENT]	<div>Leveling F</div> <div>BM#?</div> <div>=>B01</div>

<p>7. Input the information and press [ENT]. (Press [ENT] directly to skip).</p>	<p>Input Info [ENT]</p>	<div style="border: 1px solid black; padding: 5px; text-align: right;">F</div> <p>Info:#1 =>1</p>
<p>8. Input ground height of backsight point and press [ENT].</p>	<p>[ENT]</p>	<div style="border: 1px solid black; padding: 5px; text-align: right;">F</div> <p>Info:#2 =>1</p> <div style="border: 1px solid black; padding: 5px; text-align: right;">F</div> <p>Info:#3? =>1</p> <div style="border: 1px solid black; padding: 5px; text-align: right;">F</div> <p>Input BS G.H =100 m</p>

※1) The existed point data can be input in the menu→Data Manage→Input Pt.

※2) User can input three groups of notes, each notes has 16 characters of numbers or symbols

Leveling: Measurement of backsight and foresight data

Leveling measurement 1: B1→F1→F2→B2

Please see the example next page.

Operating Procedures	Operation	Display
1. After inputting the ground height of backsight point, the screen will display "Bk1 (backsight). If the previous step is "Start Leveling", screen will display BM#(Benchmark number).	Sight at Bk 1 [MEAS]	<div> Level BFFB Bk1 BM#:B01 Press [MEAS] to meas </div>
2. Sight at the staff which is on the backsight point (Bk1).		<div> Level BFFB F Bk1 BM#:B01 >>>>>>>> </div>
3. Press [MEAS] key. Example: If it measures 3 times, after surveying, the average value will be displayed for M seconds※1).		<div> Level BFFB B1Rod:0.8259m B1Dist: 3.914m N:3 >>>>>>>> </div>
4. When it is in continuous measuring mode, press [ESC] to display the last measuring data for M seconds.		<div> Level BFFB 1/2 B1Rod Ave:0.8259m B1Dist Ave: 3.914m N:3 δ:0.00mm </div>
5. Then the screen will display "Fr1" and the foresight point name will increase or descend automatically. Now press [ESC] can modify the point name. After that, collimate the staff in the foresight		<div> Level BFFB Fr1 PN :P01 Press [MEAS] to meas </div>

point (Fr1).		<div>Level BFFB 1/2</div> <div>F1Rod Ave:0.8260m</div> <div>F1 Dist Ave: 3.914m</div> <div>N:3 δ:0.02mm</div>
<p>6. Press [MEAS].</p> <p>After measuring, the average value will be displayed for M seconds.</p>		<div>Level BFFB</div> <div>Fr2</div> <div>PN :P01</div> <div>Press [MEAS] to meas</div>
<p>7. Sight at the staff in the foresight point (Fr2) and press [MEAS].</p>	Sight at Fr2 [MEAS]	<div>Level BFFB 1/2</div> <div>F2 Rod Ave:0.8260m</div> <div>F2 Dist Ave: 3.913m</div> <div>N:3 δ:0.02mm</div>
<p>8. After measuring, the average value will be displayed for M seconds.</p>		<div>Level BFFB</div> <div>Bk2</div> <div>BM#:B01</div> <div>Press [MEAS] to meas</div>
<p>9. Focus and sight at the staff in the backsight point (Bk2) and press [MEAS].</p>	Sight at Bk 2 [MEAS]	<div>Level BFFB 1/2</div> <div>B2 Rod Ave:0.8261m</div> <div>B2 Dist Ave: 3.915m</div> <div>N:3 δ:0.02mm</div>
<p>10. If there are more backsight and foresight points, user can start from the step 2 to 9.</p>		

※1) User can set the display time in the “Condition Setting”.

After measuring, following data will be displayed.

Press [▲] or [▼] key to turn page.※

After measuring the backsight point 1(Bk 1), press [▲] or [▼] to display the following interface:

Level BFFB 1/2
B1 Rod Ave:0.8259m
B1 Dist Ave : 3.914m
N:3 δ:0.00mm

Level BFFB 2/2
BM#:B01

The following items are only displayed on the N-times measuring mode:

Distance to the Backsight point

N times mode: Average value

Continuous mode: Last measuring value

N: Total measuring times

δ: Standard offset

Backsight point name

After measuring the foresight point 1(Fr 1), press [▲] or [▼] to display the following interface:

Level BFFB 1/2
F1 Rod Ave:0.8260m
F1 Dist Ave : 3.914m
N:3 δ:0.02mm

Level BFFB 2/2
H.D 1: -0.0001m
Fr GH1:99.9999m
PN :P01

Disance to the foresight point

N times mode: Average value

Continuous mode: Last measuring value

N: Total measuring times

δ: Standard offset

Height Difference from Bk1 to Fr1

Ground height of forsight point

After measuring the foresight point 2(Fr 2), press [▲] or [▼]to display the following

interface:

<div> Level BFFB 1/2 F2 Rod Ave:0.8260m F2 Dist Ave : 3.913m N:3 δ:0.02mm </div>	Distance to the foresight point N times mode: Average value Continuous mode: Last measuring value N: Total measuring times δ: Standard offset
<div> Level BFFB 2/2 d :0.000m Σ:7.828m PN :P01 </div>	d:backsight distance sum-foresight distance sum Σ:backsight distance sum+oresight distance sum Foresight point name

After measuring the backsight point 2(Bk 2), press [▲] or [▼]to display the following interface:

<div> Level BFFB 1/3 B2 Rod Ave:0.8260m B2 Dist Ave :3.915m N:3 δ:0.02mm </div>	Distance to the Backsight point N times mode: Average value Continuous mode: Last measuring value δ: Standard offset
<div> Level BFFB 2/3 E.V Limit: 0.0mm d: 0.001m Σ: 7.828m </div>	E.V:Elevation offset difference=(Bk1-Fr1)-(Bk2-Fr2) d: backsight distance sum-foresight distance sum Σ:backsight distance sum+foresight distance sum
<div> Level BFFB 3/3 H.D 2:0.0000mm Fr GH2: 100.0000m BM#:B01 </div>	Height Difference from Bk2 to Fr2 Ground height of foresight point Backsight point name

Leveling measurement 2: B1→B2→F1→F2

Operating Procedures	Operation	Display
1. After inputting the ground height of backsight point, the screen will display "Bk1 (backsight).If the previous step is "Start Leveling", screen will display BM (Bench Mark).		<div>Level BBFF</div> <div>Bk1</div> <div>BM#:B01</div> <div>Press [MEAS] to meas</div>
2. Sight at the staff in the backsight point (Bk1) and Press [MEAS] key.	Sight at Bk 1 [MEAS]	<div>Level BBFF</div> <div>Bk1</div> <div>BM#:B01</div> <div>>>>>>>>>>></div>
3. Focus and sight at the staff in the backsight point (Bk2) and press [MEAS].	Sight at Bk 2 [MEAS]	<div>Level BBFF</div> <div>Bk2</div> <div>BM#:B01</div> <div>Press [MEAS] to meas</div>
4. Sight at the staff in the foresight point [Fr1]. Meanwhile press [ESC] can change the foresight point name. Press [MEAS] to measure.	Sight at Fr1 [MEAS]	<div>Level BBFF</div> <div>Fr1</div> <div>PN:P01</div> <div>Press [MEAS] to meas</div>
5. Sight at the staff in the foresight point (Fr2) and press [MEAS].	Sight at Fr2 [MEAS]	<div>Level BBFF</div> <div>Fr2</div> <div>PN:P01</div> <div>Press [MEAS] to meas</div>
6. Move the station and sight at		

the staff in the backsight point (Bk1), and then press [MEAS]. If there are more backsight and foresight points, please repeat step 2 to 5.	Sight at Bk 1 [MEAS]	<div> Level BBFF Bk1 PN:P01 Press [MEAS] to meas </div>
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After measuring, the following data will be displayed.

Press [▲] or [▼] key to turn page※

After measuring the **backsight point 1(Bk 1)**, press [▲] or [▼] to display the following interface:

<div> Level BBFF 1/2 B1 Rod Ave:0.8259m B1 Dist Ave : 3.914m N:3 ♂:0.00mm </div>	<div> The following items are only displayed on the N-times measuring mode: Distance to the Backsight point N times mode: Average value Continuous mode: Last measuring value N: Total measuring times ♂: Standard offset Backsight point name </div>
<div> Level BFFB 2/2 BM#:B01 </div>	

After measuring the **backsight point 2(Bk 2)**, press [▲] or [▼]to display the following interface:

Level BBFF 1/2 B2 Rod Ave:0.8260m B2 Dist Ave:3.915m N:3 $\bar{\sigma}$:0.02mm	Distance to the Backsight point N times mode: Average value Continuous mode: Last measuring value $\bar{\sigma}$: Standard offset
Level BBFF 2/2 BM#:B01	Backsight point name

After measuring the **foresight point 1(Fr 1)**, press [▲] or [▼] to display the following interface:

Level BBFF 1/2 F1 Rod Ave:0.8260m F1 Dist Ave: 3.914m N:3 $\bar{\sigma}$:0.02mm	Disance to the foresight point N times mode: Average value Continuous mode: Last measuring value N: Total measuring times $\bar{\sigma}$: Standard offset
Level BBFF 2/2 H.D 1: -0.0001m Fr GH1:99.9999m PN :P01	Height difference from Bk1 to Fr1 Ground height of foresight point

After measuring the **foresight point 2(Fr 2)**, press [▲] or [▼] to display the following interface:

<div>Level BBFF 1/3</div> <div>F2 Rod Ave:0.8260m</div> <div>F2 Dist Ave: 3.913m</div> <div>N:3 $\bar{\sigma}$:0.02mm</div>	<div>Distance to the foresight point</div> <div>N times mode: Average value</div> <div>Continuous mode: Last measuring value</div> <div>N: Total measuring times</div> <div>$\bar{\sigma}$: Standard offset</div>
<div>Level BBFF 2/3</div> <div>E.V Limit:0.0mm</div> <div>d :0.000m</div> <div>Σ:7.828m</div>	<div>E.V:Elevation offset difference=(Bk1-Fr1)-(Bk2-Fr2)</div> <div>d: backsight distance sum-foresight distance sum</div> <div>Σ:backsight distance sum+oresight distance sum</div> <div>Foresight point name</div>
<div>Level BBFF 3/3</div> <div>H.D 2: 0.0000m</div> <div>Fr GH2:100.000m</div> <div>PN :P01</div>	<div>Height Difference from Bk2 to Fr2</div> <div>Ground height of foresight point</div>

Leveling measurement 3: B→F/B→I→F

Operating Procedures	Operation	Display
1. After inputting the ground height of backsight point, the screen will display "Bk1 (backsight).		<div>Level BIF</div> <div>Bk1</div> <div>BM#:B01</div> <div>Press [MEAS] to meas</div>
2. Sight at the staff in the backsight point (Bk1) and Press [MEAS] key.	Sight at Bk 1 [MEAS]	<div>Level BIF</div> <div>Bk1</div> <div>BM#:B01</div> <div>>>>>>>>>>></div>

3. Press [IN/SO] (Intermediate and Stake out) .	[IN/SO]	<div>Level BIF</div> <div>BRod Ave:0.8260m</div> <div>BDist Ave: 3.913m</div> <div>N:3 δ:0.02mm</div>
4. Chosse "Intermediate" and press [ENT].	[▲] or [▼] [ENT]	<div>Level BIF</div> <div>Fr1</div> <div>Pn :P01</div> <div>Press [MEAS] to meas</div>
5. Input the point name of intermediate point and press [ENT].	Point name [ENT]	<div>Level BIF</div> <div>►InterMediate</div> <div>Stake Out</div>
6. Input the information and press [ENT].	Info [ENT]	<div>InterMediate</div> <div>PN ?</div> <div>=>TP01_</div>
7. Focus and collimate the staff in the intermediate point. Press [MEAS] to measure.	[MEAS]	<div>InterMediate</div> <div>Info#1?</div> <div>=></div>
8. Press [REC] to save data; press [ENT] if user wants to continue intermediate point measurement; press [ESC] to exit.	[REC] [ESC]	<div>InterMediate</div> <div>PN :TP01</div> <div>Press [MEAS] to meas</div>

<p>9. Sight at the staff in the foresight point (Fr1) and press [MEAS].</p> <p>10. Focus and sight at the staff in the backsight point (Bk2) and press [MEAS].</p> <p>11. Press [IN/SO] to choose "Intermediate point and Stakeout measurement"</p> <p>12. Choose "Stake Out" and press [ENT].</p> <p>13. Whether to load the ground height data, [ENT] for yes,[ESC] for no.</p> <p>14. Input the ground height and press [ENT].</p> <p>15. Input the point name of stakeout point and press [ENT].</p>	Sight at Fr1 [MEAS]	<div>InterMediate Rod Ave: 0.9030m Dist Ave: 17.008m N:3 δ:0.02mm</div>
	Sight at Bk 2 [MEAS]	<div>InterMediate SaveData [REC] Continue [ENT] Exit [ESC]</div>
	[IN/SO]	<div>Level BIF Fr1 PN :P01 Press [MEAS] to meas</div>
	[▲] or [▼] [ENT]	<div>Level BIF Bk2 PN :P01 Press [MEAS] to meas</div>
	[ESC]	<div>Level BIF Fr2 PN :P02 Press [MEAS] to meas</div>
	[ENT]	<div>Level BIF InterMediate ► Stake Out</div>
	S.O point name [ENT]	<div>Stake Out Load Data? Yes: [ENT] No: [ESC]</div>

<p>16. Input the Info and press [ENT]</p> <p>17. Sight at the stakeout point and press [MEAS].</p> <p>18. Screen will display the S.O Rod (Stakeout rod value) and S.O H.D (Direction and Height of the staff movement).</p> <p>19. Press [REC] to save data; press [ENT] if user wants to continue intermediate point measurement; press [ESC] to exit.</p> <p>20. Press [ENT] to continue the foresight point measurement.</p>	<p>Input note</p> <p>[ENT]</p> <p>[MEAS]</p> <p>[REC]</p> <p>[ESC]</p> <p>[ENT]</p>	<div data-bbox="933 185 1220 311"> <p>Stake Out</p> <p>Input SO G.H</p> <p>=3.000 m</p> </div> <div data-bbox="933 353 1220 479"> <p>Stake Out</p> <p>Set G.H: 3.000m</p> <p>PN :G01</p> </div> <div data-bbox="933 521 1220 647"> <p>Stake Out</p> <p>Info#1</p> <p>=>_</p> </div> <div data-bbox="933 689 1220 857"> <p>Stake Out</p> <p>Set G.H: 3.000m</p> <p>PN :G01</p> <p>Press [MEAS] to meas</p> </div> <div data-bbox="933 900 1220 1068"> <p>Stake Out</p> <p>S.O Rod: 0.9980m</p> <p>S.O H.D: ↓ 0.0275m</p> <p>N:3 δ:0.02mm</p> </div> <div data-bbox="933 1111 1220 1279"> <p>Stake Out</p> <p>SaveData [REC]</p> <p>Continue [ENT]</p> <p>Exit [ESC]</p> </div> <div data-bbox="933 1321 1220 1485"> <p>Level BIF</p> <p>Fr1</p> <p>PN :P02</p> <p>Press [MEAS] to meas</p> </div>
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After measuring the backsight point 1(Bk 1), press [▲] or [▼] to display the following interface:

Level BIF 1/2 BRod Ave:0.8260m BDist Ave:3.915m N:3 δ:0.02mm	Distance to the Backsight point N times mode: Average value Continuous mode: Last measuring value δ: Standard measurement
Level BIF 2/2 PN: P05	Backsight point name

After measuring the foresight point 1(Fr 1), press [▲] or [▼] to display the following interface:

Level BIF 1/3 F2Rod Ave:0.8260m F2Dist Ave: 3.913m N:3 δ:0.02mm	Disance to the foresight point N times mode: Average value Continuous mode: Last measuring value N: Total measuring times δ: Standard offset
Level BIF 2/3 Fr GH:100.000m d :0.000m Σ:7.828m	Ground height of the foresight point d: backsight distance sum-foresight distance sum Σ:backsight distance sum+oresight distance sum
Level BIF 3/3 H.D 2: 0.0000m PN :P01	Height Difference from Bk2 to Fr2 Foresight point name

After measuring the intermediate point, press [▲] or [▼] to display the following interface:

<div>InterMediate 1/2</div> <div>Rod Ave:0.8260m</div> <div>Dist Ave:3.915m</div> <div>N:3 $\bar{\sigma}$:0.02mm</div>	<div>Distance to intermediate point</div> <div>N times mode: Average value</div> <div>Continuous mode: Last measuring value</div> <div>$\bar{\sigma}$: Standard measurement</div>
<div>InterMediate 2/2</div> <div>Int GH:2.008m</div> <div>PN :TP05</div>	<div>Ground height of intermediate point</div> <div>Point name of intermediate point (the point name will increase or descend only after being saved.)</div>

After staking out, press [▲] or [▼] to display the following interface:

<div>Stake Out 1/2</div> <div>S.O Rod: 0.8260m</div> <div>S.OH.D: ↑ 3.915m</div> <div>N:3 $\bar{\sigma}$:0.02mm</div>	<div>Measured value of the staff</div> <div>N times mode: Average value</div> <div>Continuous mode: Last measuring value</div> <div>Height difference of staff upward or downward movement.</div> <div>$\bar{\sigma}$:Standard measurement</div>
<div>Stake Out 2/2</div> <div>Dist: 12.008m</div> <div>S.O G.H0: 2.005m</div>	<div>Sight distance of stakeout point</div> <div>Ground height of stakeout point</div>

Leveling measurement 4: Outward/Return

B1→F1→F 2→B 2/ F 1→B 1→B 2→F 2

Operating Procedures	Operation	Display
1. Press [MEAS] to measure the height of the backsight bench mark (Bk1) and press [ENT].	[MEAS] [ENT]	Outward BFFB 1 Bk1 BM#:B01 Press [MEAS] to meas
2. Press [MEAS] to measure the height of foresight point (Fr1) and press [ENT].	[MEAS] [ENT]	Outward BFFB 1 Fr1 PN:P01 Press [MEAS] to meas
3. Press [MEAS] to measure the height of foresight point (Fr2) and press [ENT].	[MEAS] [ENT]	Outward BFFB 1 Fr2 PN:P01 Press [MEAS] to meas
4. Press [MEAS] to measure the height of the backsight bench mark (Bk2) and press [ENT].	[MEAS] [ENT]	Outward BFFB 1 Bk2 BM#:B01 Press [MEAS] to meas
5. Press [ENT] to continue Leveling measurement.	[ENT]	Outward BFFB 1 ENT: Next Meas REP: Repeat MENU:End

6. Press [MEAS] to measure the height of foresight point (Fr1) and press [ENT].	[MEAS] [ENT]	Outward FBBF 2 Fr1 PN:P02 Press [MEAS] to meas
7. Press [MEAS] to measure the height of backsight point (Bk1) and press [ENT].	[MEAS] [ENT]	Outward FBBF 2 Bk1 PN:P01 Press [MEAS] to meas
8. Press [MEAS] to measure the height of backsight point (Bk2) and press [ENT].	[MEAS] [ENT]	Outward FBBF 2 Bk2 PN:P01 Press [MEAS] to meas
9. Press [MEAS] to measure the height of foresight point (Fr2) and press [ENT].	[MEAS] [ENT]	Outward FBBF 2 Fr2 PN:P02 Press [MEAS] to meas
10. Press [ENT] to continue Leveling measurement.	[ENT]	Outward BFFB 2 ENT: Next Meas REP: Repeat MENU:End
11. Press [MEAS] to measure the height of the backsight bench mark (Bk1) and press [ENT].	[MEAS] [ENT]	Outward BFFB 3 Bk1 PN:P02 Press [MEAS] to meas

12. Press [MENU] to end the Leveling measurement.	[MENU]	<div>Outward FBBF 6</div> <div>ENT: Next Meas</div> <div>REP: Repeat</div> <div>MENU:End</div>
13. Press [ENT] to confirm	[ENT]	<div>Outward FBBF 6</div> <div>Even station,</div> <div>End meas?</div> <div>Yes: [ENT] No: [ESC]</div>
14. Press [▲] [▼] to choose "End Outward".	[▲][▼] [ENT]	<div>Outward FBBF 6</div> <div>CP Close</div> <div>► End Outward</div>
15. Input PN (point name) and press [ENT] to confirm.	Input PN [ENT]	<div>Outward FBBF 6</div> <div>PN ?</div> <div>=>_</div>
16. Input the information and press [ENT] to confirm.	Input Info [ENT]	<div>Outward FBBF 6</div> <div>Info#1</div> <div>=>_</div>
17. Press [▲] [▼] to view the measurement data.	[▲][▼]	<div>Outward FBBF 6 1/2</div> <div>Δh CP 0.558m</div> <div>ΔhΣCP 1.007m</div> <div>ΣD CP 52.00m</div>
18. Press [ENT] to continue the return measurement.	[ENT]	

19. Press [MEAS] to measure the height of backsight point (Bk1) and press [ENT].	[MEAS] [ENT]	Outward FBBF 6 2/2 ΣD BM 108.05m G.H BM 5.007m
20. Press [MEAS] to measure the height of foresight point (Fr2) and press [ENT].	[MEAS] [ENT]	Return BFFB 1 Bk1 BM#:P06 Press [MEAS] to meas
21. Press [MENU] to end the measurement.	[MENU]	Return FBBF 2 Fr2 PN :P07 Press [MEAS] to meas
22. Press [ENT] to confirm.	[ENT]	Return FBBF 6 ENT: Next Meas REP: Repeat MENU:End
23. Press [▲][▼] to choose.	[▲][▼]	Return FBBF 6 Even station, End meas Yes: [ENT] No: [ESC]
24. Input the point name and press [ENT] to confirm.	Point name [ENT]	Return FBBF 6 CP Close ► End Return
25. Input the note and press [ENT] to confirm.	Info [ENT]	Return FBBF 6 PN ?

26. Press [▲][▼] to view the measurement data.	[▲][▼]	=>
27. Press [ENT] to exit Return Leveling measurement.	[ENT]	<div>Return FBBF 6</div> <div>Info#1 =></div>
		<div>Return FBBF 6 1/2</div> <div>Δh CP 0.558m</div> <div>$\Delta h \Sigma CP$ 0.003m</div> <div>ΣD CP 52.00m</div>
		<div>Return FBBF 6 2/2</div> <div>ΣD BM 110.08m</div> <div>G.H BM 5.003m</div>
		<div>Menu 1/2</div> <div>Standard Mode</div> <div>► Leveling</div> <div>Adjust</div>

After measuring, following data will be displayed.

Press [▲] or [▼] key to switch the page

After measuring the backsight point 1(Bk 1), press [▲] or [▼] to display the following interface:

<div>Level BFFB 1/2</div>	<p>The following items only display on the N-times measuring mode:</p> <p>Distance to the Backsight point</p>
---------------------------	---

<div>B1Rod Ave:0.8259m B1Dist Ave: 3.914m N:3 $\bar{\sigma}$:0.00mm</div>	<div>N times mode: Average value Continuous mode: Last measuring value N: Total measuring times $\bar{\sigma}$: Standard offset</div>
<div>Level BFFB 2/2 BM#:B01</div>	<div>Backsight point name</div>

After measuring the foresight point 1(Fr 1), press [▲] or [▼] to display the following interface:

<div>Level BFFB 1/2 F1Rod Ave:0.8260m F1Dist Ave: 3.914m N:3 $\bar{\sigma}$:0.02mm</div>	<div>Distance to the foresight point N times mode: Average value Continuous mode: Last measuring value N: Total measuring times $\bar{\sigma}$: Standard offset</div>
<div>Level BFFB 2/2 H.D 1: -0.0001m Fr GH1:99.9999m PN :P01</div>	<div>Height difference from Bk1 to Fr1 Ground height of foresight point</div>

After measuring the foresight point 2(Fr 2), press [▲] or [▼] to display the following interface:

<div> Level BFFB 1/2 F2Rod Ave:0.8260m F2Dist Ave: 3.913m N:3 δ:0.02mm </div>	Distance to the foresight point N times mode: Average value Continuous mode: Last measuring value N: Total measuring times δ: Standard offset
<div> Level BFFB 2/2 d :0.000m Σ:7.828m PN :P01 </div>	d: backsight distance sum-foresight distance sum Σ:backsight distance sum+oresight distance sum Point name of backsight point

After measuring the backsight point 2(Bk 2), press [▲] or [▼] to display the following interface:

<div> Level BFFB 1/3 B2Rod Ave:0.8260m B2Dist Ave:3.915m N:3 δ:0.02mm </div>	Distance to the Backsight point N times mode: Average value Continuous mode: Last measuring value δ: Standard measurement
<div> Level BFFB 2/3 E.V Limit:0.0mm d: 0.001m Σ: 7.828m </div>	E.V: Elevation offset difference = (Bk1-Fr1)-(Bk2-Fr2) d: backsight distance sum-foresight distance sum Σ:backsight distance sum+oresight distance sum
<div> Level BFFB 3/3 H.D 2:0.0000mm Fr GH2: 100.0000m BM#:B01 </div>	Foresight point name Height difference from Bk2 to Fr2 Ground height of foresight point Point name of backsight point

Introduction to point name of leveling measurement

Point Name Modification

Before measuring the foresight point, the point name can be modified, please refer to the next chapter "Modify the Point Name"

Available Characters In Point Name

Numeral, capital letters and "-" can be used for point name which is up to 8 characters. The used point name can be reused.

Auto Decreasing and Increasing of the Point Name

Please refer to the Chapter 9 "Set".

Auto Increase Stepsize

If the last character of the last inputted point name is numeral, the point name will add 1 automatically.

Auto Numeral Increasing

As if the point name is less than 8 characters, the number will move rightward and add 1 automatically.

Example: Last	ABCD-99
Now	ABCD-100

As if the point name is 8 characters, the number will not move.

Example: Last	ABCDE-99
Now	ABCDE-00

Auto Decreasing Stepsize

If the last character of the last inputted point name is numeral, the point name will descend 1 automatically.

When the last character is greater than 1, the numeral character will descend 1.

Example: Last	ABC-02
Now	ABC-01
Next	ABC-00

When the last character is 0

Next character will be "9" and up to 8 characters.

Example: Last ABC-00
 Now ABC-9999
 Next ABC-9998

Note: When the point name is only numeral, then it will descend 1. As if the point name is 1, next one will be "99999999".

●Modify the Point Name

User can modify the point name before measuring the foresight point 1 (Fr1)

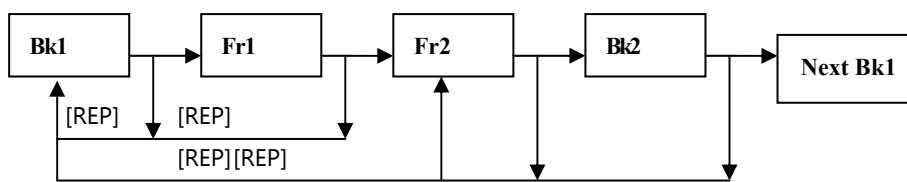
Operating Procedures	Operation	Display
1. Press [ESC] before foresight measurement, the point name will move leftward.	[ESC]	<div>Level BFFB</div> <div>Fr1</div> <div>PN :P01</div> <div>Press [MEAS] to meas</div>
2. Press [ESC] (C) to delete the character.	[ESC] 3 times	<div>Level BFFB</div> <div>PN ?</div> <div>=>P01</div>
3. Input a new poing name ※ 1), 2) [For example:2008];	2008	<div>Level BFFB</div> <div>PN ?</div> <div>=></div>
4. Press [ENT].	[ENT]	<div>Level BFFB</div> <div>PN ?</div> <div>=>2008</div>

<p>※1) The inputted alphabets or numerals can be up to 8 characters</p> <p>※2) The used point name can be reused in the same Leveling measurement.</p>		<div data-bbox="906 138 1171 188"></div> <div data-bbox="906 232 1171 403"> Level BFFB Fr1 PN :2008 Press [MEAS] to meas </div>
--	--	--

Repeated Measuring key [REP]

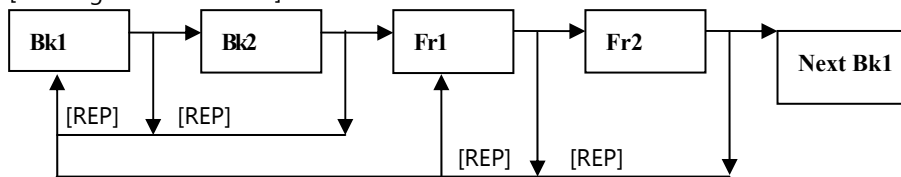
[REP] key is used for recollecting the surveying data of backsight or foresight points when the measurement is incorrect. The saved data before repeating measuring will not influence on every calculating result.

[Leveling Measurement 1]



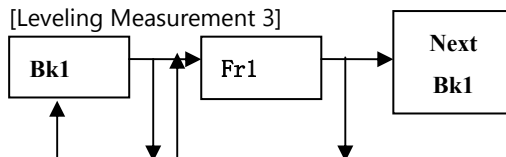
- After measuring the Bk1 or Fr1, user can repeat the measurement form Bk1.
- After measuring the Fr2 or Bk2, user can repeat the measurement from Fr2 or Bk1.

[Leveling Measurement 2]



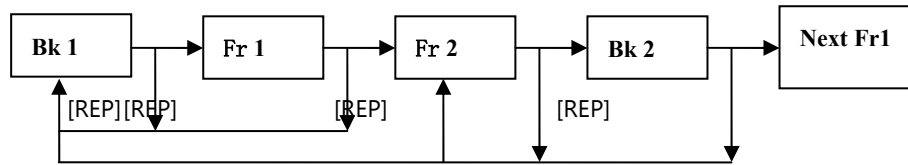
- After measuring the Bk1 or Bk2, user can repeat the measurement form Bk1.
- After measuring the Fr1 or Fr2, user can repeat the measurement from Fr1 or Bk1.

[Leveling Measurement 3]

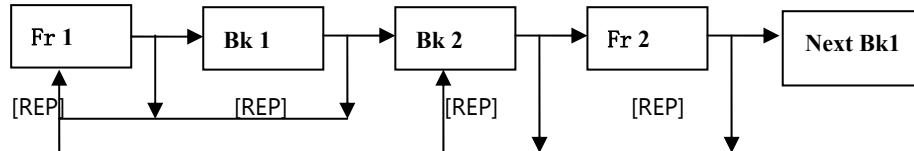


[REP] [REP]

[Leveling Measurement 4]



- After measuring the Bk1 or Fr1, user can repeat the measurement form Bk1.
- After measuring the Fr2 or Bk2, user can repeat the measurement from Fr2 or Bk1.



- After measuring the Bk1 or Fr1, user can repeat the measurement form Bk1.
- After measuring the Fr2 or Bk2, user can repeat the measurement from Fr2 or Bk1.

Example:[Leveling Measurement 1] After measuring Fr2, user can remeasure from Bk1

Operating Procedures	Operation	Display
1. When "Bk2" shows on the screen, press [REP].	[REP]	<div>Level BFFB</div> <div>Bk2</div> <div>BM#:B01</div> <div>Press [MEAS] to meas</div>
2. Press [ENT] to confirm which measurement needs to be remeasured.	[ENT]	<div>Level BFFB</div> <div>Repeat meas FS2 ?</div> <div>PN :P01</div> <div>Yes: [ENT] No: [ESC]</div>
3. Sight at backsight point and press [MEAS] to remeasure. After that, the measured data will	[MEAS]	<div>Level BFFB</div> <div>Repeat meas BS1 ?</div> <div>BM#:B01</div>

display for N second.		Yes: [ENT] No: [ESC]
4. Sight at foresight point and press [MEAS] to remeasure.	Sight at backsight press [MEAS]	Level BFFB Bk1 BM#:B01 Press [MEAS] to meas
5. Sight at Fr2 and press [MEAS] to remeasure.	Sight at foresight press [MEAS]	Level BFFB Fr1 PN :P01 Press [MEAS] to meas
6 Sight at Foresight and press [MEAS]	Sight at foresight press [MEAS]	Level BFFB Fr2 PN :P01 Press [MEAS] to meas

Intermediate Measurement [IN/SO]

[IN/SO] key is used for collecting the separated intermediate point and sideshot point data in Leveling measurement.

Operating Procedures	Operation	Display
1. After measuring the backsight point, press [IN/SO].	[IN/SO]	Level BFFB Fr1 PN :P01 Press [MEAS] to meas
2. Press [ENT] to set the instrument to be ready for the	[ENT] Input PN	Level BFFB ► InterMediate

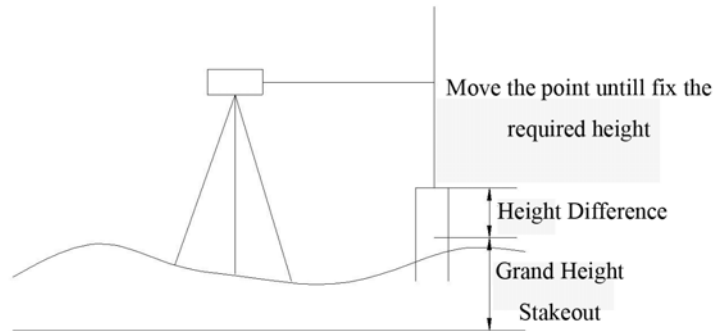
<p>intermediate point measurement.</p> <p>3. Input the point name and information of the intermediate point.</p> <p>4. Collimate the staff in the intermediate point and press [MEAS]. After measurement, the rod average value will be displayed for M seconds.</p> <p>5 Press [ENT], the instrument is ready for the next intermediate point measurement; after being recorded, the point name will increase automatically; If user want to collect more data of intermediate point, please repeat the step 4 and 5.</p> <p>6. Press [ESC] to exit and return to the Leveling measurement.</p>	<p>[ENT]</p> <p>Input Info [ENT]</p> <p>Collimate intermediate press [MEAS]</p> <p>[▲] or [▼]</p> <p>Press [REC],[ENT] or [ESC]</p>	Stake Out
		InterMediate PN ? =>TP01_
		InterMediate Info#1 =>_
		InterMediate PN :TP01 Press [MEAS] to meas
		InterMediate 1/2 Rod Ave:2.9378m Dist Ave:32.455m N:3 δ:0.02mm
		InterMediate 2/2 Int GH:10.0000m PN:TP01
		InterMediate SaveData [REC]

		Continue [ENT] Exit [ESC]
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StakeOut Key [IN/SO]

In stakeout mode, user can stakeout the point with presetting ground height.

According to the record mode setting, the coordinate data of stakeout point can be saved in "Memory" or "SD card".



Operating Procedures	Operation	Display
1. After the backsight measurement press [IN/SO] before taking the foresight measurement.	[IN/SO]	Level BFFB Fr1 PN :P01 Press [MEAS] to meas
2. Press [▲]or[▼] to choose "Stake Out"	[ENT]	Level BFFB InterMediate ► Stake Out
3. Press [ENT], the coordinate of stakeout point can be recalled in the flash or SD card, which can be choose in the Condition Setting.	[ENT]	Stake Out Load Data ? Yes:[ENT] No:[ESC]

4. Press [▲] or [▼] to choose one job and press [ENT].	[▲] or [▼] [ENT]	<div>Select JobP02</div> <div>► J01 J02 J03</div>
5. Press [▲] or [▼] to choose one point and press [ENT].	[▲] or [▼] [ENT]	<div>Select PoiP01</div> <div>► P01 P02</div>
6. Confirm the chosen point and press [ENT];	[ENT]	<div>Select PoiP01</div> <div>PN :P01 G.H:10.0011m Yes: [ENT] No: [ESC]</div>
7. Input point name and press [ENT];	Input PN [ENT]	<div>Stake Out</div> <div>Set G.H: 10.0011m PN :G01_</div>
8. Input the information and press [ENT];	Input Info [ENT]	<div>Stake Out</div> <div>Info#1 =>_</div>
9. Sight at the staff in the stakeout point and press [MEAS]. After measuring, 3-times measuring value and the average value will be displayed.	[MEAS]	<div>Stake Out</div> <div>Set G.H: 10.0011m PN :G01 Press [MEAS] to meas</div>
10. Press [ENT] to stakeout next		<div>Stake Out 1/2</div> <div>S.O Rod: 0.0020m S.O H.D: ↓ 1.002m</div>

point, the point name will increase automatically; press [ESC] to exit the Stakeout mode and go back to the Leveling measurement.	[REC], [ENT] or [ESC]	N:3 δ:0.02mm
		Stake Out SaveData: [REC] Continue: [ENT] Exit: [ESC]

The presetting coordinate data is not in the "memory" or "SD card".

[Example 2] Manually input the ground height, point name and other information of the stakeout point, the measuring time is 3.

Operating Procedures	Operation	Display
1. After the backsight measurement press [IN/SO] before taking the foresight measurement. Use [▲] or [▼] to choose "Stake Out", then press [ENT].	[IN/SO] [▲] or [▼] [ENT]	Level InterMediate ► Stake Out
2. Press [ESC] to cancel recalling the data from memory.	[ESC]	Stake Out Load Data Yes:[ENT] No:[ESC]
3. Input the ground height and press [ENT].	Input G.H [ENT]	Stake Out Input SO G.H =10 m
4. Input the point name and press [ENT].	Input PN [ENT]	Stake Out Set G.H:10.000m PN :G01

5. Input the note and press [ENT];	Input note [ENT]	<div data-bbox="903 192 1198 353"> Stake Out Info#1 => </div>
6. Sight at the staff in the stakeout point and press [MEAS]. After measuring, 3-times measuring value and the average value will be displayed.	Sight at stakeout point [MEAS]	<div data-bbox="903 416 1198 566"> Stake Out Set G.H:10.000m PN :G01 Press [MEAS] to meas </div>
7. Press [ENT] to stakeout next point, the point name will increase automatically; press [ESC] to exit the Stakeout mode and go back to the Leveling measurement.	Press [REC] or [ENT],[ESC]	<div data-bbox="903 633 1198 790"> Stake Out 1/2 S.O Rod:0.0020m S.O H.D ↑ 1.002m N:3 δ:0.02mm </div> <div data-bbox="903 842 1198 1003"> Stake Out SaveData: [REC] Continue: [ENT] Exit: [ESC] </div>

4.2 End the Leveling Measurement on the Transition Point

User can end the leveling measurement job on the transition point

The close job can be restarted. If user wants to continue the leveling measurement job from a transition control point, please refer to "Continue Leveling".

Please see the example next page.

Operating Procedures	Operation	Display
1. After measuring, when the screen display "Bk1", press [MENU] before next measurement.	[MENU]	<div>Level BFFB Bk1 PN :P01 Press [MEAS] to meas</div>
2. Press [▲] or [▼] to choose "End Leveling".	[▲] or [▼] [ENT]	<div>Leveling Start Leveling Continue leveling ► End Leveling</div>
3. Select "CP Close" and press [ENT].	[ENT]	<div>Level BFFB ► CP Close BM Close</div>

<p>4. Input the transition control point (CP) name.</p> <p>5. Input information 1 and 2.</p> <ul style="list-style-type: none"> Press [ENT] to skip inputting the information. Up to 16 characters can be inputted. <p>6. Press [ENT].</p> <p>7. Press [▲] or [▼] to view the data</p> <p>8. Press [ENT] to exit.</p>	Input CP name + [ENT]	<div>Level BFFB PN ? =></div>
	Input Info 1 [ENT]	<div>Level BFFB Info#1 =></div>
	Input Info 2 [ENT]	<div>Level BFFB Info#2 =></div>
	[▲] or [▼]	<div>Level BFFB 1/2 Δh CP: 0.000m Δh ΣCP: 0.002m ΣD CP: 38.950m</div>
	[ENT]	<div>Level BFFB 2/2 ΣD ΣCP: 233.676m G.H.CP : 10.0002m</div>
		<div>Menu 1/2 Standard Mode ► Leveling Adjust</div>

4.3 End the Leveling Measurement on the Bench Mark Point

Operating Procedures	Operation	Display
1. After measuring, when the screen display "Bk1", press [MENU] before next measurement.	[MENU]	<div>Level BFFB</div> <div>Bk1</div> <div>PN :P01</div> <div>Press [MEAS] to meas</div>
2. Press [▲] or [▼] to choose "End Leveling".	[▲] or [▼] [ENT]	<div>Leveling</div> <div>Start Leveling</div> <div>Continue leveling</div> <div>► End Leveling</div>
3. Select "BM Close" and press [ENT].	[ENT]	<div>Level BFFB</div> <div>CP Close</div> <div>► BM Close</div>
4. Input the bench mark (BM) point name and press [ENT].	Input BM name [ENT]	<div>Level BFFB</div> <div>PN ?</div> <div>=></div>
5. Input information 1 and 2. • Press [ENT] to skip inputting the information. Up to 16 characters can be inputted.	Input Info 1 [ENT]	<div>Level BFFB</div> <div>Info#1</div> <div>=></div>
6. Press [▲] or [▼] to view the data	Input Info 2 [ENT]	<div>Level BFFB</div> <div>Info#2</div> <div>=></div>

7. Press [ENT] to exit.	[▲] or [▼]	Level BFFB 1/2 Δh CP: 0.000m Δh ΣCP: 0.002m ΣD CP: 38.950m
	[ENT]	Level BFFB 2/2 ΣD ΣBM: 233.676m G.H.BM : 10.0002m
		Menu 1/2 Standard Mode ► Leveling Adjust

Note: If user end the Leveling measurement on the bench mark point, this leveling measurement job is over. User can not continue this job.

4.4 Continue Leveling

This function is used for continuing the leveling measurement.

- The "Out Module" in the setting mode should be "Flash" or "SD".
- The Leveling measurement job must be ended by the "CP Close".
- For saving data, the "Out Module" should be set as "Flash" or "SD".

Operating Procedures	Operation	Display
1. Select "Leveling" and press [ENT].	[MENU]	Menu 1/2 Standard Mode ► Leveling Adjust
2. Press [▲] or [▼] to select "Continue Leveling" and press [ENT].	[▲] or [▼] [ENT]	Leveling Start Leveling ► Continue Leveling End Leveling

<p>3. Press [▲] or [▼] to select a job and press [ENT].</p>	<p>[ENT]</p>	<div data-bbox="906 190 1200 358"> <p>Select Job</p> <p>► J01</p> <p>J02</p> <p>J03</p> </div>
<p>4. Collimate the backsight point (Bk) and press [MEAS] to remeasure. After measuring, the result will be displayed for M seconds.</p>	<p>Collimate BK</p> <p>[MEAS]</p>	<div data-bbox="906 407 1200 575"> <p>Level BFFB</p> <p>Bk1</p> <p>PN :P05</p> <p>Press [MEAS] to meas</p> </div>

5. OTHER FUNCTIONS

5.1 Manually Inputting Data Key—[MANU]

According to some causes, it can not use [MEAS] key to take measurement. User can use [MANU] to manually input the rod reading and distance from instrument to the staff.

[Example]: In the process of Leveling measurement

Operating Procedures	Operation	Display
1. When measuring the backsight, foresight or intermediate points, user can use [MANU] key instead of [MEAS].	[MANU]	<div>Level BFFB</div> <div>Bk1</div> <div>PN :P03</div> <div>Press [MEAS] to meas</div>
2. Input the rod value and press [ENT]. Note: The range of inputted rod value is -4.9999 ~ +4.9999 m	Input rod value + [ENT]	<div>Level BFFB</div> <div>Rod ?</div> <div>=1.0410m</div>
3. Input the distance and press [ENT]. Note: The range of distance value is 0 ~ 99.9999m.	Input distance + [ENT]	<div>Level BFFB</div> <div>Dist ?</div> <div>=10.000m</div>
		<div>Level BFFB 1/2</div> <div>B1 Rod 1.0410m</div> <div>B1 Dist 10.000m</div> <div>N:Manu</div>

4. According to the previous point is foresight or backsight point, system will go to next step.		Level BFFB 2/2 PN :P03
		Level BFFB Fr1 PN :P04 Press [MEAS] to meas

[Example]: In the process of Standard Measurement

Operating Procedures	Operation	Display
1. While displaying the point name, use [MANU] instead of [MEAS].	[MANU]	Measure Press [MEAS] to meas Meas#:1
2. Input the rod value and press [ENT].	Input rod value + [ENT]	Measure Rod ? =1.0410m
3. Input the distance and press [ENT].	Input distance + [ENT]	Measure Dist ? =10.000m
4. Press [ENT] to save data. Press [ESC] to cancel saving.	[ENT] or [ESC]	Measure Record Data? Yse: [ENT] No: [ESC]
	[ENT]	Measure Rod: 1.0410m Dist: 10.000m

	[MEAS]	N: MANU
		Measure Press [MEAS] to meas Meas#:1

5.2 Display the Distance—[DIST]

Before measuring, user can use [DIST] to check the distance in order to make sure the distance of foresight and backsight points are the same.

5.3 Inverse Staff Mode—[-]

Inverse staff mode is used for measuring the inverse staff which aims at measuring the ceiling.

First of all, user should set the "Inverse Mode" in setting mode as "Use". Please refer to chapter 8 "Set Mode" for more details.

Operating Procedures	Operation	Display
1. Press [-] to set the INVERSE MODE as ON, then the screen will display the symbol 'I'. 2. Collimate the inverse staff and press [MEAS]. 3. Press [-] again to return to the normal measuring mode.	[-]	Measure Press [MEAS] to meas PN :1
		Measure I Press [MEAS] to meas PN :1
	Collimate staff + [MEAS]	Measure 1/2 I Rod Ave:-1.9766m Dist Ave:19.008m N:3 δ:0.02mm
		Measure 1/2 Rod Ave:-1.9766m Dist Ave:19.008m N:3 δ:0.02mm

5.4 Record Data Search—[SRCH]

[SRCH] key can be used for searching and displaying the data stored in internal memory or SD card which can be set in the "Out Module".

["Out Module" is set as "Flash"]

[Example]: Searching the bench mark (BM) point

Operating Procedures	Operation	Display
<p>1. Press [SRCH] at the main menu.</p> <p>2. Press [▲] or [▼] to choose the search type and press [ENT].</p> <p>3. Input the search contents.</p>	[SRCH]	<div>Menu 1/2</div> <div>► Standard Mode</div> <div>Leveling</div> <div>Adjust</div>
	[▲] or [▼] [ENT]	<div>Search</div> <div>Job</div> <div>PN</div> <div>► BM#</div>
	Input BM point name + [ENT]	<div>Input BM#</div> <div>BM#?</div> <div>=> B01</div>
	[SRCH]	<div>Input BM#</div> <div>BM#?</div> <div>=> B01</div> <div>Press [SRCH] to search</div>
	[SRCH]	<div>Level BFFB</div> <div>BM#:B01</div> <div>G.H:19.008m</div> <div>E.V Limit:2.00mm</div>
	[SRCH]	<div>Level BBFF</div> <div>BM#:B01</div> <div>G.H:10.001m</div> <div>E.V Limit:2.50mm</div>

- After search the bench mark point, press [▲] or [▼] to display the last or next data.
- If the searching goes to the end, the screen will display “No data, EOF”.
- Press [ESC] once or twice to return.

["Out Module" is set as "SD"]

Only the files in the same group can be searched.

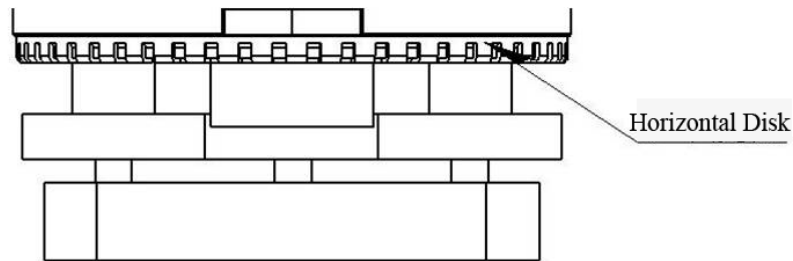
[Example]: Searching the bench mark (BM) point

Operating Procedures	Operation	Display
1. Press [SRCH] at the main menu.	[SRCH]	<div>Menu 1/2</div> <div>► Standard Mode</div> <div>Leveling</div> <div>Adjust</div>
2. Press [▲] or [▼] to choose the group and press [ENT].	[▲] or [▼] [ENT]	<div>Group</div> <div>► AAA</div> <div>BBB</div>
3. Press [▲] or [▼] to choose the search type and press [ENT].	[▲] or [▼] [ENT]	<div>Search</div> <div>Job</div> <div>PN</div> <div>► BM#</div>
4. Input the search contents.	Input BM point name	<div>Input BM#</div> <div>BM#?</div> <div>=>B01</div>
	[SRCH]	<div>Input BM#</div> <div>BM#?</div> <div>=>B01</div> <div>Press [SRCH] to search</div>

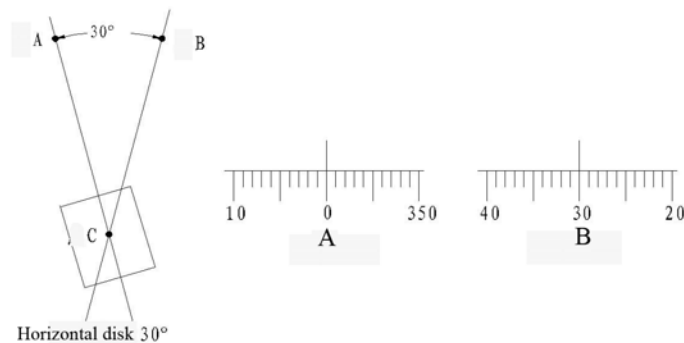
	[SRCH]	<div>Level BFFB BM#:B01 G.H:19.008m E.V Limit:2.00mm</div>
	[SRCH]	<div>Level BBFF BM#:B01 G.H:10.001m E.V Limit:2.50mm</div>

6 HORIZONTAL ANGLE MEASUREMENTS

This instrument is equipped with a horizontal dial which can be used for horizontal angle measurement. Every 1° with a graduation, every 10° with a mark in the dial, and the graduation increases from 0° to 350° in clockwise direction.



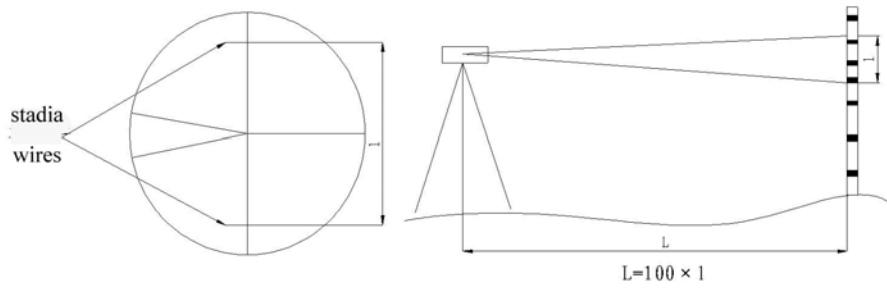
- (1) First, set up and level the instrument in start point C. Second, sight the telescope to backsight point A, and rotate the horizontal tangent screw until crosshair is accurately on the staff at point A. Rotate the horizontal dial at 0° .
- (2) Sight the telescope to point B, and adjust the horizontal tangent, until the crosshair is accurately on the staff at point B. And the angle reading is angle between target A and target B, i.e. $\angle ACB$.



Optical Distance Measure

With the stadia hair of the instrument and the graduation on the staff, you can measure the distance easily. The stadia interval on the staff multiplies 100 is the distance. The stadia interval is the interval between the upper hair and the lower hair on the reticle.

- (1) Set up the staff on the target point.
- (2) Set up and level the instrument. Sight the telescope to the staff. Record the stadia interval between upper hair and lower wire as "1".
- (3) The distance "L" between instrument and staff is $L=100 \times 1$.



7. FORMAR FLASH OR SD CARD

This function is used for deleting the all files in the memory or SD card, which can not be recycled after formatting. In order to avoid the mistake in deleting the data, the system requires to input the password while formatting. The password is set by the factory and user can not modify it. Please note that this is the only page where record the code.

Password: 519

SD Card Formatting

Operating Procedures	Operation	Display
1. Press [MENU] and use [▲] or [▼] to choose "Format" and press [ENT].	[▲] or [▼] [ENT]	<div>Menu 2/2 Data Manage ► Format</div>
2. Input the password:519, then press [ENT].	Password: 519 + [ENT]	<div>Format Input password =></div>
3. Press [▲] or [▼] to choose "SD" and press [ENT].	[▲] or [▼]	<div>Format Format Flash ► Format SD</div>
4. Confirm the information and	[ENT]	<div>Format SD Format OK?</div>

press [ENT].		Yes:[ENT] No:[ESC]
		Format SD Format...
		Format SD Formatted
		Format SD Power off Auto Power Off.

Memory Formatting

Operating Procedures	Operation	Display
1. Press [MENU] and use [▲] or [▼] to choose "Format" and press [ENT].	[▲] or [▼] [ENT]	Menu 2/2 Data Manage ► Format
2. Input the password:519, then press [ENT].	Password: 519 [ENT]	Format Input password =>
		Format

3. Press [▲] or [▼] to choose “Flash” and press [ENT].	[▲] or [▼]	<div data-bbox="909 145 1173 264"><div>► Format Flash</div><div>Format SD</div></div>
4. Confirm the information and press [ENT].	[ENT]	<div data-bbox="909 318 1173 488"><div>Format</div><div>Flash</div><div>Format OK?</div><div>Yes:[ENT] No:[ESC]</div></div> <div data-bbox="909 533 1173 703"><div>Format</div><div>Flash</div><div>Format...</div></div> <div data-bbox="909 748 1173 918"><div>Format</div><div>Flash</div><div>Formatted</div></div> <div data-bbox="909 963 1173 1133"><div>Format</div><div>Flash</div><div>Power off</div><div>Auto Power Off.</div></div>

8. DATA MANAGE

This chapter will introduce how to use “Data Manage” of main menu to manage the memory (RAM) and SD card. The following functions are included:

- Make group in the SD card
- Search (this function is the same as “SRCH”)
- Copy Job (Two ways: one is from memory to SD card, the other is from SD card to memory)
- Delete job in the memory or SD card
- Check the capacity of memory or SD card
- Export file to the computer

Files in the Memory and SD Card

Job and coordinate data can be saved in the memory or SD card in the following way.

Flash

JOB01.M
JOB02.L
JOB021.A
JOB022.L

.
.

SD card G01

JOB01.M
JOB02.L
JOB021.M
JOB022.L

.
.

G02

JOB01.M
JOB02.L

JOB021.M

JOB022.L

- No file in the internal memory.
- The file can not be created in the SD card when, in a group, it exists a file with same name.
- According to the file type, the file will add the extension name in the following order:
 - .L: Leveling measurement data file
 - .M: Standard measurement data file
 - .A: Adjustment data file
 - .H: Ground height file
 - .T: Inputted point file

According to the file type, user can transfer the inputted points file, standard measurement file, leveling measurement file and ground height file to the computer with USB connector. The default communication port setting is as following:

Band Rate: 9600, Data Bits: 8 Stop Bits: 1, Parity: None.

8.1 Create Group

User can create one or more group which is convenient for view and check.

Operating Procedures	Operation	Display
1. Press [▲] or [▼] to choose "Data Manage".	[▲] or [▼]	<div>Menu 2/2</div> <div>► Data Manage</div> <div>Format</div>
2. Press [ENT] to enter, then press [▲] or [▼] to choose "Make Group" and press [ENT].	[ENT] [▲] or [▼]	<div>Data Manage 1/3</div> <div>► Make Group</div> <div>Input Pt</div> <div>Search</div>
3. Input the group name and press [ENT].	Input Group	<div>Data Manage</div> <div>Group Name?</div> <div>=>G01</div>
After the screen display "OK!", it will return to the "Data Manage" screen.	Name [ENT]	<div>Data Manage</div> <div>Making Group.....</div> <div>G01</div>
		<div>Data Manage</div> <div>OK!</div>
		<div>Data Manage 1/3</div> <div>► Make Group</div> <div>Input Pt</div> <div>Search</div>

8.2 Search Job

Beside coordinate data, user can easily search the job in the file of SD card or internal memory according to the "Out Module" setting.

Operating Procedures	Operation	Display
1. Press [▲] or [▼] to choose "Data Manage".	[▲] or [▼]	<div>Menu 2/2</div> <div>► Data Manage</div> <div>Format</div>
2. Press [ENT] to enter, then press [▲] or [▼] to choose "Search" and press [ENT].	[ENT] [▲] or [▼]	<div>Data Manage 1/3</div> <div>Make Group</div> <div>Input Pt</div> <div>► Search</div>
3. Press [▲] or [▼] to choose a group and press [ENT].	[▲] or [▼] [ENT]	<div>Select Group 1</div> <div>► G01</div> <div>G02</div> <div>G03</div>
4. Press [▲] or [▼] to choose the type of job, and press [ENT].	[ENT]	<div>Search</div> <div>► Standard Mode</div> <div>Leveling</div> <div>Adjust</div>
5. Press [▲] or [▼] to choose a job.	[ENT]	<div>Select JobP01</div> <div>► J01</div> <div>J02</div> <div>J03</div>
• Press [ESC] to return to the Menu screen.		

8.3 Copy Job

The job in the SD card can be copied to the internal memory, vice versa.

Operating Procedures	Operation	Display
1. Press [MENU] and [▲] or [▼] to choose "Data Manage".	[▲] or [▼] [ENT]	Menu 2/2 ► Data Manage Format
2. Press [MENU] and [▲] or [▼] to choose "Copy Job", then press [ENT].	[▲] or [▼] [ENT]	Data Manage 2/3 ► Copu Job Delete Job Check Capacity
3. Press [▲] or [▼] to choose "SD" and press [ENT].	[▲] or [▼] [ENT]	Copy from Flash ► SD
4. Press [▲] or [▼] to select a group and press [ENT].	[ENT]	Select GroP01 ► G01 G02 G03
5. Press [▲] or [▼] to select the job type and press [ENT].	[ENT]	Job Type 1/2 ► Standard Mode Leveling Adjust
6. Press [▲] or [▼] to select a job and press [ENT].		Select JobP01 ► J01 J02

<p>7. Press [▲] or [▼] to choose “SD” and press [ENT].</p> <p>8. Press [▲] or [▼] to select a group and press [ENT].</p>		J03
	[ENT]	Copy to Flash ▶ SD
	[▲] or [▼] [ENT]	Select GroP01 G01 ▶ G02 G03
	[▲] or [▼] [ENT]	Data Manage Complete
		Data Manage 2/3 ▶ Copu Job Delete Job Check Capacity

8.4 Delete Job

According to the “Out Module” setting, user can delete the job data which is saved in SD card or internele memory.

Operating Procedures	Operation	Display
1. Press [MENU] and [▲] or [▼] to choose “Data Manage”.	[▲] or [▼] [ENT]	Menu 2/2 ► Data Manage Format
2. Press [MENU] and [▲] or [▼] to choose “Delete Job”, then press [ENT].	[▲] or [▼] [ENT]	Data Manage 2/3 Copu Job ► Delete Job Check Capacity
3. Press [▲] or [▼] to select a group and press [ENT].	[▲] or [▼] [ENT]	Select GroP01 ► G01 G02 G03
4. Press [▲] or [▼] to select the job type and press [ENT].	[ENT]	Job type 1/2 Standard Mode ► Leveling Adjust
5. Press [▲] or [▼] to select a job and press [ENT].	[ENT]	Select JobP01 ► J01 J02 J03
6. Press [ENT] to confirm.	[ENT]	Data Manage

		Delect? Standard:J01 Yes:[ENT] No:[ESC]
	[ENT]	Data Manage Completed
		Select GroP01 ► G01 G02 G03

8.5 Check the Capacity of Flash or SD Crad

User can check the capacity of flash or SD card by the following method.

Operating Procedures	Operation	Display
1. Press [MENU] and [▲] or [▼] to choose "Data Manage".	[▲] or [▼] [ENT]	Menu 2/2 ► Data Manage Format
2. Press [MENU] and [▲] or [▼] to choose "Capacity", then press [ENT].	[▲] or [▼] [ENT]	Data Manage 2/3 Copu Job Delete Job ► Check Capacity
3. Press [▲] or [▼] to choose "Flash" and press [ENT].	[▲] or [▼] [ENT]	Check Capacity ► Flash SD

4. Press any key to go back to the previous screen.	[ENT]	<div>Check Capacity</div> <div>Flash:96%</div> <div>Press Any Key exit</div>
	[ENT]	<div>Check Capacity</div> <div>► Flash</div> <div>SD</div>

8.6 File Out

The jobs in files or internal memory can be transferred to external instrument.

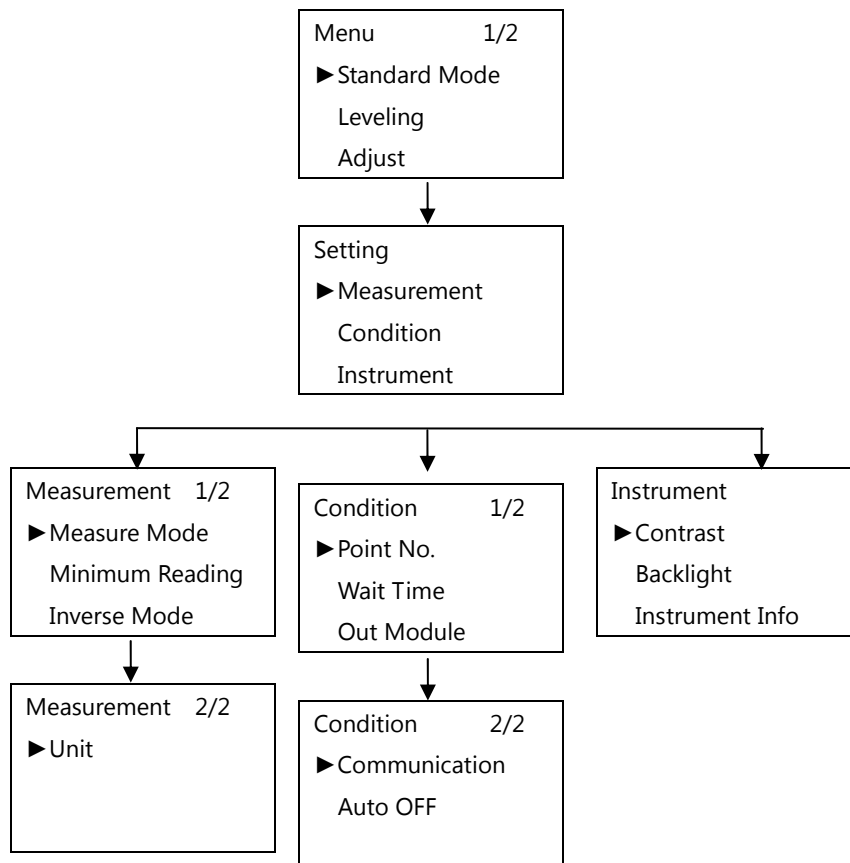
Operating Procedures	Operation	Display
1. Press [MENU] and [▲] or [▼] to choose "Data Manage".	[▲] or [▼] [ENT]	<div>Menu 2/2</div> <div>► Data Manage</div> <div>Format</div>
2. Press [MENU] and [▲] or [▼] to choose "File Out", then press [ENT].	[▲] or [▼] [ENT]	<div>Data Manage 3/3</div> <div>► File Out</div>
3. Press [▲] or [▼] to choose Flash and press [ENT].	[▲] or [▼] [ENT]	<div>Select Memory</div> <div>► SD</div> <div>Flash</div>

4. Press [▲] or [▼] to select job type and press [ENT].	[▲] or [▼] [ENT]	<div>Job Type</div> <div>► Standard Mode</div> <div>Leveling</div> <div>Adjust</div>
5. Press [▲] or [▼] to select the job and press [ENT].	[▲] or [▼] [ENT]	<div>Select JobP01</div> <div>► J01</div> <div>J02</div> <div>J03</div>
6. Press [ENT] to confirm.	[ENT]	<div>Data Manage</div> <div>Send Data?</div> <div>J01</div> <div>Yes:[ENT] No:[ESC]</div>
7. After sending, the screen will go back to "Data Manage".		<div>Data Manage</div> <div>Sent</div>

9. SET

The “Set” mode is used for setting the parameters of leveling measurement, for example, user can set the unit, communication parameter etc. The setting will remain after switching off.

9.1 Set Menu



1. Measurement Mode:

In "Measurement Mode" user can select one of the following measure modes. Single, N Times and Continuous. It is recommended to increase the number of measurements to carry out a high-accurated result.

Option	Function
N Times	Set the N times measurement mode. The range of N is 1 to 99
Single	Single measurement mode
Continuous	Continuous measurement mode

2. Minimum Reading:

"Minimum Reading" is used for setting the minimum reading unit

Option	Function
Standard	1mm
Precise	0.1mm

3. Inverse Mode:

"Inverse Mode" is used for setting the inverse staff measurement. Please refer to the "Inverse Staff Mode"

Option	Function
No Use	No use the "inverse Mode"
Use	Use the "Inverse mode"

4. Unit:

"Unit" is used for setting the unit.

Option	Function
m	Measurement unit: m(meter)
ft	Measurement unit: US.ft(US.Feet) 1m=3.28083333333333ft

5. Out Module:

"Out Module" is used for setting whether to save the data and the place where it will be save.

Please refer to the: Setting the Data Out Module”

Option	Function
Flash	To save data in internal memory
SD	To save data in SD card
USB	To connect the instrument with computer
OFF	Do not save the data

6. Point No.

“Point No.” is used to selecting the point name increasing or decreasing.

7. Wait Time:

“Wait Time ” is used for setting the display time which is from a certain screen to the next screen.

Option	Function
M Second	1~9 seconds optional

8. Communication

“Communication” is used for setting the parameters of communication.

1 st Menu	2 nd Menu	Function
Standard	-----	Standard setting: Baudrate:9600, Data Bits:8, Stop Bits:1, Parity: None
User	Baudrate	Baudrate:300/600/1200/2400/4800/9600
	Parity	Parity unit: Even, Odd and None optional

9. Auto OFF:

“Auto OFF” is used for setting whether to use the “Auto Off” function.

If this function is on, the instrument, without any operation, will be off in 5 minutes.

Option	Function
ON	To set the “Auto OFF” as ON
OFF	To set the “Auto OFF” as OFF

10. Contrast:

"Contrast" is used for setting the contrast of the screen which has 9 degrees.

Option	Function
Contrast	To set one of the 9 degrees contrast.

11. Backlight:

"Backlight" is used for setting whether to open the backlight.

12. Instrument Infor:

In this function, user can check the instrument information such as: Model, serial number and produce date.

9.2 Alter the Setting Mode

Example 1: To set the measurement time as 3.

Operating Procedures	Operation	Display
1. Before measuring or at the menu, press [SET] to display the "Setting" interface.	[SET]	<div>Menu 1/2</div> <div>► Standard Mode</div> <div>Leveling</div> <div>Adjust</div>
2. Press [▲] or [▼] to select "Measurement" and press [ENT].	[▲] or [▼] [ENT]	<div>Setting</div> <div>► Measurement</div> <div>Condition</div> <div>Instrument</div>
3. Press [▲] or [▼] to select "Measure Mode" and press [ENT].	[▲] or [▼] [ENT]	<div>Measurement 1/2</div> <div>► Measure Mode</div> <div>Minimum Reading</div> <div>Inverse Mode</div>

4. Press [▲] or [▼] to select "N Times" and press [ENT].	[▲] or [▼] [ENT]	<div>Measure Mode</div> <div>Single</div> <div>► N Times</div> <div>Continuous</div>
5. Input 3 and press [ENT].	3 + [ENT]	<div>Measure Mode</div> <div>Measuring times?</div> <div>N=3_</div> <div>(1-99)</div>

- Using the average value of N-times measurement can improve the measuring accuracy.

10. BATTERY AND CHARGER

The on-board battery is NB-21.

Charging

- (1) The output voltage of the charger is AC110V~220V. The electric current is 450mA.
- (2) Red light means the battery is being charged. Green light means charging is finished.
- (3) It will take 5 hours to charge the battery.
- (4) Unplug the power plug after charging.

Note: a. Battery-charging should be in the temperature of 10°C~40°C

b. When the charging time exceeds the suggested charging time, the battery life might be shortened.

c. The battery may discharge in storage. Inspect the battery before use if the instrument is stored for a long time.

d. The battery should be stored in a temperature below 30°C, and should be recharged every three or four months.

10. ADJUSTMENT

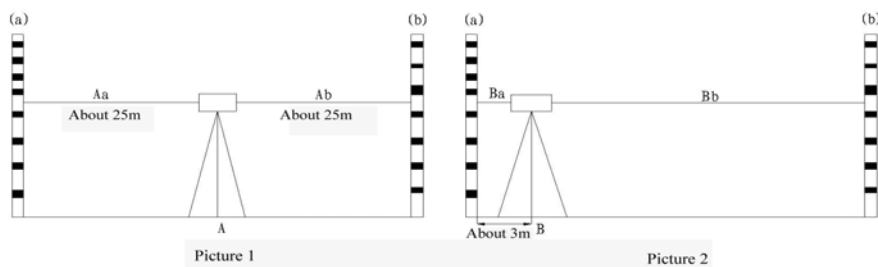
Circular Vial Adjustment

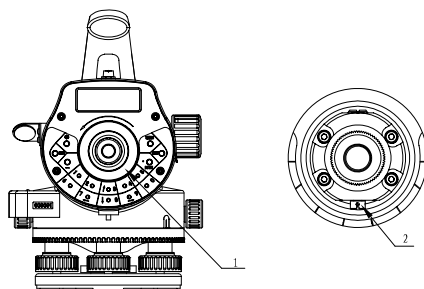
1. Mount the instrument on a tripod. Center the circular vial precisely by rotating the 3 tribrach screws.
2. Rotate the instrument 180°. If the bubble is not in the center, the circular vial should be calibrated as follow:
 - a. Firstly, identify the bubble moving direction, and adjust the corresponding screws to move the bubble half of the offset.
 - b. Level the circular vial with the 3 tribrach screws again.
 - c. rotate the instrument around again to check whether the bubble is centered in every direction. If not, please repeat the steps a & b until the bubble is centered.

Difference of Line of Sight

10.1 Method A

1. Two staffs are about 50m away, set up the tripod in the center and attach the instrument on it.
2. Leveling the instrument;
3. The inspektations are as follow:





Operating Procedures	Operation	Display	
1. Select "Adjust" according to the screen display and press [ENT].	[▲] or [▼] [ENT]	<div>Menu 1/2</div> <div>Standard Mode</div> <div>Leveling</div> <div>► Adjust</div>	
2. Press [▲] or [▼] to choose "Method A" and press [ENT].	[▲] or [▼] [ENT]	<div>Adjust</div> <div>► Method A</div> <div>Method B</div>	
3. Input the job name and press [ENT].	Job name [ENT]	<div>Adjust</div> <div>Job Name?</div> <div>=> J01</div>	
4. Input the information 1 and press [ENT].	Info 1 [ENT]	<div>Adjust</div> <div>Info #1</div> <div>=> 1</div>	
5. Input the information 2 and press [ENT].	Info 2 [ENT]	<div>Adjust</div> <div>Info #2</div> <div>=> 2</div>	

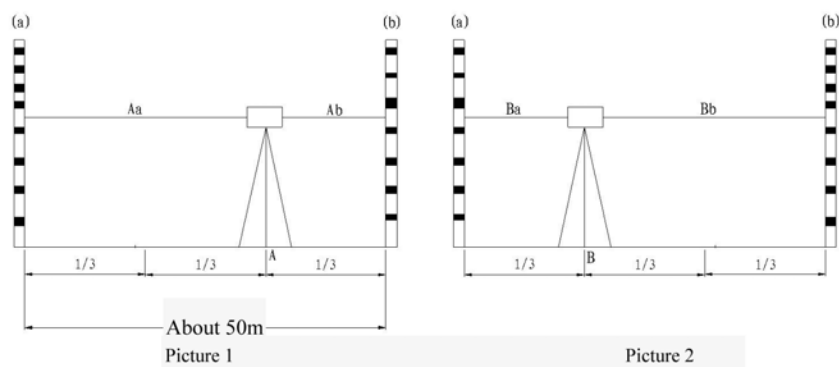
<p>6. Input the information 3 and press [ENT].</p> <p>7. Collimate the staff in point a and press [MEAS] (As shown in the figure 1), meanwhile, take measurement and the screen will display Aa.</p> <p>8. Collimate the staff in point b and press [MEAS] (As shown in the figure 1), meanwhile, take measurement and the screen will display Ab.</p> <p>9. Move the instrument to point B and level it (As shown in the figure 2). At this time, user can switch off the instrument to save power.</p> <p>10. Collimate the staff in point a and press [MEAS] (As shown in the figure 2), meanwhile, take measurement and the screen will display Ba.</p>	<p>Info 3 [ENT]</p> <p>[MEAS]</p> <p>[MEAS]</p>	<div data-bbox="932 188 1198 356"> Adjust Info #3 =>3 </div> <div data-bbox="932 405 1198 573"> Adjust A Point:A Rod:a a←-----A b Press [MEAS] to meas </div> <div data-bbox="932 622 1198 790"> Adjust A Point:A Rod:a Aa Rod:1.0567m N:3 δ:0.02mm </div> <div data-bbox="932 840 1198 1008"> Adjust A Point:A Rod:b a A----->b Press [MEAS] to meas </div> <div data-bbox="932 1057 1198 1225"> Adjust A Point:A Rod:b Ab Rod:1.0567m N:3 δ:0.02mm </div> <div data-bbox="932 1274 1198 1442"> Adjust Method A Move A----->B Relocate </div>
---	---	---

16. Press [ENT] to return to the "Adjust" interface.	[ENT]	<div>Adjust</div> <div>Method A</div> <div>Adjust Crosshair?</div> <div>Bb Rod:1.0567m</div>
		<div>Menu 1/2</div> <div>Standard Mode</div> <div>Leveling</div> <div>► Adjust</div>

- To cancel the inspection, user just needs to press [ESC] among step 1 to 11.
- When the instrument displays the error information; press [ESC] to continue the inspection.

10.2 Method B

1. As shown in figure 1, attach the instrument on the tripod and set the tripod on the point A and B which trisect the distance between the two staffs.
2. Leveling the instrument.



3. The inspection process is the same with Method A

11. TRANSPORTATION, STORING AND CLEANING

Transportation

- (1) In outdoor operation, the instrument should be stored in the carrying case, or fixed on the tripod and carried on the shoulder. Make sure not to carry the instrument upside down.
- (2) In road transportation, do not leave too much space between instrument cases. Normally, the instrument should be stored in a special case in road transportation.
- (3) In plane, train or ship transportation, the instrument should be stored in original carrying case and carton.
- (4) Delivering the battery: related law and rules should be totally understood. Inform the carrier before the shipment.

Storage

- (1) Notice the temperature when storing the instrument, especially the temperature inside the car in hot summer.
- (2) The battery should be removed if the instrument will be stored for a long time.
- (3) Do not store the wet instrument into the case before it is wiped dry.

Clean

- (1) Clean the instrument after use.
 - a. If the instrument is wet by seawater, it should be wiped with a wet cloth and then be dried by a dry cloth.
 - b. Wipe the dust on the instrument with a clean brush and a soft cloth. Do not blow it with compressed air.
 - c. Wipe the dust on the objective lens with a clean brush, and wipe it with cotton with mixture of alcohol and ether.
- (2) When cleaning the plastic parts of the instrument, do not use volatile liquid such as thinner and benzene. Neutral cleansing is suggested.
- (3) Check each parts of the tripod after long-term use; make sure the screw and brake parts are tighten.
- (4) Clean the staff after use; otherwise it will influence on the accuracy. Do not use volatile liquid such as thinner and benzene to clean the staff.
- (5) Store the staff in safe place. And cover the joints of the staff with cloth.

12. SPECIFICATION

Model Specification		DL-201	DL-2007
height accuracy (standard deviation for 1km double run leveling)	digital reading	1.0mm	0.7mm
	optic reading	2.0mm	
distance accuracy	digital reading	$D \leq 10m: 10mm; D > 10m: D \times 0.001$	
distance range	digital reading	1.5m~105m	
minimum display	HD	1mm/0.1mm	
	distance	0.1/1cm	
measuring time		within 3s in normal condition	
telescope	magnification	32×	
	resolving power	3"	
	field of view	1°20'	
	multi-constant	100	
	add-constant	0	
compensator	type	magnetic-damped	
	range	$> \pm 12'$	
	accuracy	0.30" /1'	
data storage	storage	16MB	
	point name	increasing/decreasing/user-defined	
	connection	USB	
	External Storage	SD Card	
circular vial accuracy		8'/2mm	
auto power off		5minutes/OFF	
horizontal dial	graduation	1°	
display		LCD display of 160*64dpi with illuminator	
Working temperature		-20℃~50℃	
dimension		230mm(L)×150mm(W)×210mm(H)	
weight		2.5kg	